

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

## Scheme of Teaching & Examination

### BE VIth Semester Biotechnology

S. No	Board of Study	Subject Code	Subject	Period per week			Scheme of Exam			Total Marks	Credit L+(T+P) 2
				L	T	P	ESE	CT	TA		
1	Biotechnology	318611(18)	Immunology-I	3	1	-	80	20	20	120	4
2	Biotechnology	318612(18)	Plant Tissue Culture Technology	4	-	-	80	20	20	120	4
3	Appl. Mathematics	318613(14)	Bio-Statistics	4	1	-	80	20	20	120	5
4	Biotechnology	318614(18)	Bio-Informatics	3	1	-	80	20	20	120	4
5	Biotechnology	318615(18)	Environmental Biotechnology	3	1	-	80	20	20	120	4
6	Refer Table 1		Professional Elective I	4	-	-	80	20	20	120	4
7	Biotechnology	318621(18)	Immunology-I Lab	-	-	3	40	-	20	60	2
8	Biotechnology	318622(18)	Tissue Culture Technology Lab	-	-	3	40	-	20	60	2
9	Biotechnology	318623(18)	Bio-Informatics Lab	-	-	3	40	-	20	60	2
10	Biotechnology	318624(18)	Environmental Biotechnology Lab	-	-	3	40	-	20	60	2
11	Management etc	300625(36)	Managerial Skills	-	-	2	-	-	40	40	1
12			Library	-	-	1	-	-	-	-	-
<b>Total</b>				<b>21</b>	<b>4</b>	<b>15</b>	<b>640</b>	<b>120</b>	<b>240</b>	<b>1000</b>	<b>34</b>

L: Lecture, T: Tutorial, P: Practical, ESE: End Semester Exam, CT: Class Test, TA: Teachers Assessment

**Note :-** Industrial Training of twelve weeks is mandatory for B.E. students. It is to be completed in two equal parts. The first part must have been completed in summer after IV sem. The second part to be completed during summer after VI sem. after which students have to submit a training report which will be evaluated by college teachers during B.E. VII sem.

**Table 1**

<b>Professional Elective-1</b>			
S.No	Board of Study	Subject Code	Subject
1	Chemical Engg.	318631(19)	Catalyst Engineering
2	Chemical Engg.	318632(19)	Fertilizer Technology
3	Chemical Engg.	318633(19)	Bioprocess Plant Design

**Note:** (1)- 1/4<sup>th</sup> of total strength of students subject to minimum of 20 students is required to offer an elective in the college in a particular Academic session.

(2)- Choice of elective course once made for an examination cannot be change in future examination.

## **Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)**

Semester: VI

Subject: Immunology-I

Total Theory Periods: 40

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Branch: Biotechnology

Code: 318611(18)

Total Tut Periods: 12

- Unit 1:-** Overview of immune system, its need, external defense, immune defense and antigens. Cells of innate immune system– phagocytes, natural killer cells, mast cells and basophiles, dendrites, etc.
- Unit 2:-** Adaptive immune system– lymphocytes, lymphoid organs and tissues. Development of immune system, hemopoiesis, T cell and B cell. Primary and secondary immune organs.
- Unit 3:-** Molecules of innate immunity– complements, acute phase proteins, interferons, etc. Antibodies, their basic structure, classes, diversity and functions. Allotypes and idiotypes.
- Unit 4:-** Cytokines and their multiple functions, Cytokine families, Antigen recognition epitopes, paratopes and heptanes.
- Unit 5:-** MHC- its discovery, role of MHC, its molecular structure, binding of peptides to MHC molecules, MHC restriction. Antigen–Antibody interaction.

### **Name of Text Books:**

1. Kubey – Immunology by R. A. Goldsby, T.J. Kindl, B.A. Osborne.
2. Essentials of Immunology by Iran Roit, Blanks Publications Oxford, 1988.

### **Name of Reference Books:**

1. Fundamentals of Immunology by W.E. Paul – Raven Press, Newyork 1998.
2. Immunology- Introductory Text Book by Shetty and Nandini
3. Principles of Immunology by N. V. Sastry
4. A. L. Lehninger, D.L. Nelson, M.M. Cox- “ Principles of werth publishers, 2000.
5. L. stryer, J.M. Berge, J.L. Tymoezko-“Biochemistry “ W.H. freeman & Co. 2002.

**Chhattisgarh Swami Vivekanand Technical University,  
Bhilai (C.G.)**

Semester : VI

Subject: Plant Tissue Culture Technology

Total Theory Periods: 50

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Branch: Biotechnology

Code: 318612(18)

Total Tut Periods: Nil

- Unit 1:-** History, introduction, laboratory organization, medias used and aseptic manipulation.
- Unit 2:-** Basic aspects– Cell culture, cellular totipotency and somatic embryogenesis.
- Unit 3:-** Application of tissue culture in plant breeding, haploid production, triploid production, in vitro pollination, zygotic embryo culture, somatic hybridization and cybridization, genetic transformation. Somaclonal and gametoclonal variation and their selection.
- Unit 4 :-** Application of tissue culture in horticulture and forestry– production of disease free plant and clonal propagation.
- Unit 5:-** Introduction to plant growth hormone. Industrial application of tissue culture. Germplasm conservation.

**Name of Text Books:**

1. Biotechnology by B. D. Singh, Kalyani Publication
2. An Introduction to plant tissue culture by M. K. Razdon, Oxford & I.B.H. Publishing Co. Pvt. Ltd.

**Name of Reference Books:**

1. Plant tissue Culture – Application and Limitations S.S. Bhojwane (1990), Elsevier, Amsterdam.
2. Micro propagation : P.C. Degergh & R. H. Zommeronom (1990) Kluwer Acadmic Publ. Dordrecht.
3. Trangenic Plants – Lindsey & Jones.
4. Plants, genes & crop improvement, Crispeels ASPB, 2002

## Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester : VI

Subject: Bio-statistics

Total Theory Periods: 50

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Branch: Appl Mathematics

Code: 318613(14)

Total Tut Periods: 12

- Unit 1:-** Presentation of data frequency distribution, graphical presentation by histogram, frequency curve and cumulative frequency curves. Measure of location and dispersion– mean, median, mode and their simple properties (without derivation) and calculation of median by graphs, (Range, mean deviation, standard deviation, coefficient of variation).
- Unit 2:-** Probability and distribution, random distribution, definition of probability (single exercise), definition of binomial, poisson and normal distribution of their interrelations
- Unit 3:-** Co-relation and Regression– Bivariate data (Single , correlation and regression coefficient, their relations), limits of correlation coefficient, effect of change of origin and scale on correlation coefficient.
- Unit 4:-** Test of Significance– sampling distribution of mean and standard error, Large sample test (test for an assume mean and equality of two population means with known SD), small sample test (t-test for an assume mean and equality of means of two populations when sample observations are independent). T-test for comparison of variants of two populations, chi-square test for independence of attributes, goodness of fit & homogeneity of sample.
- Unit 5:-** Experimental design– principles of experimental design, completely randomized block and latin square design, analysis of variants (ANOVA), its use in analysis of RBD.

### Name of Text Books:

1. Statistical methods in biology by Norman T.J. Bailey (3<sup>rd</sup> edition), Combridge University Press (1995).
2. Biostatistical Analysis by Zar and H. Jerrold

**Chhattisgarh Swami Vivekanand Technical University,  
Bilai (C.G.)**

Semester: VI

Subject: Bio-Informatics

Total Theory Periods: 40

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Branch: Biotechnology

Code: 318614(18)

Total Tut Periods: 12

- Unit 1:-** Bio-informatics– introduction and history of bio-informatics. Sequences and nomenclature– DNA sequencers, amino acid sequencers of proteins, types of sequences in nucleotide sequence database.
- Unit 2:-** Database and search tool – databases and analytical tools.  
  
Application of databank – FASTA, BLAST, PDB, Microbial and cellular databank, hybridoma databank, genbank, cDNA bank.
- Unit 3:-** Analysis using bioinformatic tools– detection of genes, identification of function of new gene, identification of functional domains, detection of non-coating RNA, genome annotation and molecular phylogenetics
- Unit-4:-** Pairwise alignment of sequences, functional and structural relationship between different sequences. Multiple sequence alignment, methods of multiple sequence alignment, phylogenetic predictions , different methods used for phylogenetic prediction.
- Unit 5:-** Genome Mapping– different types of maps. Human genome project, applications of genome mapping, chromosome maps.

**Name of Text Books:**

1. S. Misener and S. A. Krawetz, “Bioinformatics methods and protocols, Humana press 2000.
2. H. Rashidi and L. K. Buehler, “Bioinformatics Basics”, CRC Press, 2000.

**Name of Reference Books:**

1. Bioinformatics: A practical guide to the analysis of genes and proteins A.D. Baxevanis and B. F. F. ouellelte (eds). 2002 John Wiley and sons.
2. Bioinformatics : Sequence and genome analysis by D. W, mount, cold spring Harbor Laboratory Press.
3. Bioinformatics Computing by Bergeron and Bryan

**Chhattisgarh Swami Vivekanand Technical University,  
Bhilai (C.G.)**

Semester: VI

Subject: Environmental Biotechnology

Total Theory Periods: 40

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Branch: Biotechnology

Code: 318615(18)

Total Tut Periods: 12

- Unit 1:-** Introduction to environment– concept of ecology and ecosystem, environmental pollution, (water, soil and air). Noise and thermal pollution, their sources and effect.
- Unit 2:-** Sewage and waste water treatment, aerobic and anaerobic treatment, conventional and advanced treatment technology. Emerging biotechnological processes in waste water treatment and various microorganism used in it.
- Unit 3:-** Bioremediation and Biore Restoration – reforestation through micropropagation, development of stress tolerant plants, use of mycorrhiza for reforestation, wormiculture technology, composting.
- Unit 4:-** Microbial leaching and mining– extraction of metal from ores, recovery of metals from solutions, microbes in petroleum extraction. Introduction to biofertilizer, biopesticides, bioinsecticides and bioherbicides.
- Unit 5:-** Degradation of Xenobiotic Compounds– organisms involve in degradation of chlorinated hydrocarbons, substituted simple aromatic compounds, polyaromatic hydrocarbons and pesticides.

**Name of Text Books:**

1. Environmental Biotechnology by Alan Scrogg (1999) : Langman.
2. Foster C.F, John ware D.A., “ Environmental Biotechnology” , Ellis Horwood, Ltd; 1987.

**Name of Reference Books:**

1. Stanir R.Y., Ingraham J. L. wheelis M. L., Painter R. R., “ General microbiology”, Mcmillan Publications 1989.
2. Environmental Biotechnology by S. N. Jogdan
3. Environmental Biotechnology by Geeta Bali
4. Environmental Microbiology and Biotechnology by D. P. Singh and S. K. Dwivedi
5. Introduction to Environmental Biotechnology by A. K. Chatterji

# Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: VI

Branch: Biotechnology

Subject: Catalyst Engineering

Code: 318631(19)

Total Theory Periods: 50

Total Tut Periods: Nil

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

**Unit 1:-** Fundamental Aspects of Catalysis; Homogeneous and Heterogeneous catalysis; Adsorption; Biocatalysis; Catalysts: Definition, properties; Kinetics of catalyzed reactions: steps in catalysis, rate law, mechanism, limiting steps; Classification of catalysts, catalyst preparation, promoters, inhibitors, Deactivation of catalysts: Mechanism of Rate Equation, Rate Equation from experiments;

**Unit 2:-** Catalyst Effectiveness; Thiele Modulus; Impact of reactor type and Catalyst performance on yield and selectivity; Systematic strategies for reactor and catalyst selection; Structured systems; Design of reactors for gas-solid reactions; Solid Catalysts-determination of surface area, void volume, solid density, pore volume and pore distribution; Solid Catalyzed Reactions: Rate Equation, Controlling resistance Phenomenon, experimental methods for finding rates.

**Unit 3:-** Enzyme as Biological Catalyst, Classification, Nomenclature, Enzyme assay; specific activity, enzyme activity units; Kinetics of Enzyme catalyzed reactions: Enzyme-substrate complex and enzyme action, single enzyme kinetics, step rate constants, modulation and regulation of enzymatic activity, enzyme deactivation.

**Unit 4:-** Factors affecting the efficiency of enzyme as catalyst –Proximity and Orientation Covalent analysis, acid base catalysis. Specificity, broad Specificity, intermediate specificity, stereo specificity.

**Unit 5:-** Applied enzyme catalysts-application of hydrolytic enzymes; Immobilized enzyme technology; Immobilized enzyme kinetics.

## **Name of Text Books:**

1. Chemical Reaction Engg.- H.Scott Fogler
2. Chemical Reaction Kinetics- J.M. Smith

## **Name of Reference Books:**

1. Chemical Reaction Engg.-Octave Levenspiel
2. Bio Chemical engg.- Balley Ollise
3. Biochemistry- Lehninger A.L.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: VI

Subject: Fertilizer Technology

Total Theory Periods: 50

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Branch: Biotechnology

Code: 318632(19)

Total Tut Periods: Nil

**Unit 1:-** INTRODUCTION TO CHEMICAL FERTILIZERS: Chemical inorganic Fertilizers and Organic manures. Types of fertilizer- Mixed, complex and granulated, plant nutrients.

**Unit 2:-** PROCESSES FOR RAW MATERIALS: Processes for manufacture of ammonia, nitric acid and phosphoric acid.

**Unit 3:-** NITROGENOUS AND POTASH FERTILIZERS: Processes for urea and di-ammonium phosphate. Recovery of Potassium salts processes for ammonium chloride and ammonium phosphate.

**Unit 4:-** COMPLEX FERTILIZERS: Processes for nitro - Phosphorous and complex NPK fertilizers, liquid fertilizers.

**Unit 5:-** PHOSPHATIC FERTILIZERS AND INDIAN FERTILIZER INDUSTRY: Single and Triple super phosphate, bio-fertilizer. Fertilizer Industry in India

## **Name of Text Books:**

1. Strelizoff, "Technology and Manufacture of Ammonia", 2nd.' Edn.,Wiley,1981.
2. L. J. Carpentire, "New Developments in Phosphate Fertilizer Technology", Elsevier, 1971.

## **Name of Reference Books:**

1. M. E. Pozin, "Fertilizer Manufacture", MIR Publishers, Moscow, 1986.
2. "Handbook on Fertilizer Technology", Fertilizer Association of India ,near JNU, New Delhi 1992.
3. V. Slack, "Phosphoric Acid", 2" Bin., Marcell Dekkar, 1968



**Chhattisgarh Swami Vivekanand Technical University,  
Bhilai (C.G.)**

Semester: VI

Subject: Bioprocesses Plant Design

Total Theory Periods: 50

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Branch: Biotechnology

Code: 318633(19)

Total Tut Periods: Nil

- Unit 1:-** Review of mass and energy balance concepts. Development of the flow sheet and its description. Piping and instrumentation diagrams.
- Unit 2:-** Detailed design of the following equipments: Double pipe heat exchanger, shell and tube heat exchanger
- Unit 3:-** Design of distillation columns: sieve tray type, bubble cap type.
- Unit 4:-** Design of cylindrical and spherical vessels for internal and external pressures, heads and closures, storage tanks.
- Unit 5:-** Design of tall vertical vessels. Selection of fluid moving machinery. Design aspects aimed at maintaining aseptic conditions. Bioprocess validation.

**Name of Text Books:**

1. Process Equipment Design - D.Q. Kern
2. Introduction to chemical equipment design – B.C Bhattacharya

**Name of Reference Books:**

1. Process Plant Design – Richardson and Coulson Vol 6
2. Conceptual Design of Chemical Process – J. M. Douglas
3. Process Plant Design – Backhurst and Harker
4. Mass Transfer Equipment Design data Book.
5. Chemical Equipment Design – Earnest E. Ludwig

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)**

Semester: VI

Subject: Immunology-I Lab

Total Practical Periods: 40

Total Marks in End Semester Exam: 40

Branch: Biotechnology

Practical Code: 318621(18)

## **Experiments to be performed:**

1. Determination of Blood groups.
2. R.B.C. counting.
3. W.B.C. counting.
4. Estimation of Blood Hemoglobin.
5. Differential Count of Blood leucocytes.
6. Widal Test.
7. Antigen–Antibody precipitation test.
8. Sensitivity of Microorganisms to antibiotics
9. Determination of concentration of penicillin G using agar diffusion (cup plate) method
10. Minimum inhibitory concentration (MIC) of penicillin G

## **List of Equipments/Machine Required:**

1. Haemocytometer
2. Incubator
3. Refrigerator
4. Microscope
5. Micro-pipette

## **Recommended Books:**

1. Refer Books mentioned in theory syllabus

**Chhattisgarh Swami Vivekanand Technical University,  
Bilai (C.G.)**

Semester: VI

Subject: Tissue Culture Technology Lab

Total Practical Periods: 40

Total Marks in End Semester Exam: 40

Branch: Biotechnology

Practical Code: 318622(18)

**Experiments to be performed:**

1. Introduction to plant Tissue culture.
2. Sterilization of plant materials
3. Media preparation.
4. Isolation and culture of plant protoplast
5. shoot Culture.
6. Root Culture.
7. Anther Culture.
8. Study of somatic embryogenesis.
9. study of plant Hormone.
10. Callus Culture.
11. Protoplast fusion (Somatic cell hybridization)

**List of Equipments/Machine Required:**

1. Autoclave
2. Centrifuge
3. Distillation Unit
4. Gyrotory Shaker (that moves in a circular/spiral path)
5. Microscopes

**Recommended Books:**

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

**Chhattisgarh Swami Vivekanand Technical University,  
Bhilai (C.G.)**

Semester: VI

Branch: Biotechnology

Subject: Bio-Informatics Lab

Practical Code: 318623(18)

Total Practical Periods: 40

Total Marks in End Semester Exam: 40

**Experiments to be performed: (Minimum 10)**

1. Pairwise Alignment of nucleotide sequences using BLAST software.
2. Pairwise Alignment of nucleotide sequences using FASTA software.
3. Pairwise Alignment of protein sequences using BLAST software.
4. Pairwise Alignment of protein sequences using FASTA software.
5. Multiple sequence alignment of nucleotide sequences using CLUSTALW software.
6. Multiple sequence alignment of protein sequences using CLUSTALW software.
7. Multiple sequence alignment of nucleotide sequences using T-Coffee software.
8. Multiple sequence alignment of protein sequences using T-Coffee software.
9. Phylogenetic prediction of nucleotide sequences using TREETOP software.
10. Phylogenetic prediction of protein sequences using TREETOP software.
11. Identification of functional domains using CDD software.
12. Identification of functional domains using Interproscan software.
13. Computational identification of domains and their phylogenetic predictions.
14. secondary structure prediction of proteins using 3d-PSSM software.
15. Identification of 3D-structures of proteins using Geno3D software.

**List of Equipments/Machine Required:**

1. Computers for analyzing data using various softwares (P-4 computers with 256 MB RAM)

**Recommended Books:**

1. Refer books mentioned in theory syllabus

**Chhattisgarh Swami Vivekanand Technical University,  
Bhilai (C.G.)**

Semester: VI

Subject: Environmental Biotechnology Lab

Total Practical Periods: 40

Total Marks in End Semester Exam: 40

Branch: Biotechnology

Practical Code: 318624(18)

**Experiments to be performed:**

1. Determination of total dissolved solid in water
2. Determination of dissolved oxygen in water
3. Determination of Biochemical Oxygen demand (BOD)
4. Determination of Chemical Oxygen demand of water (COD)
5. Determination of water hardness
6. Determination of permanent Dissolved  $\text{CO}_2$  in water.
7. Determination of total bacterial population by standard plate count technique
8. MPN test for detection of water contamination (Coliform Test)
9. Detection of bacterial population in milk by SPC
10. Detection of arsenic by microbiological method

**List of Equipments/Machine Required:**

1. Evaporating Dish
2. Hot Water Bath
3. Desiccator
4. Balance
5. Thermometer
6. Heating Menter

**Recommended Books:**

1. Experiments in Microbiology, Plant Pathology and Biotechnoogy by K R Aneja
2. Refer Books mentioned in theory syllabus

# Chhattisgarh Swami Vivekanand Technical University, Bilai (C.G.)

Semester: VI  
Subject: Managerial Skills  
Total Practical Periods: 28  
Total Marks in End Semester Exam: 40  
Minimum number of class test to be conducted: 2

Branch: Common to all Branches  
Code: 300625 (36)  
Total Tut Periods: NIL

## Unit-I

Managerial Communication Skills: Importance of Business Writing: writing business letters, memorandum, minutes, and reports- informal and formal, legal aspects of business communication, oral communication- presentation, conversation skills, negotiations, and listening skills, how to structure speech and presentation, body language.

## Unit-II

Managerial skills: Leadership: Characteristics of leader, how to develop leadership; ethics and values of leadership, leaders who make difference, conduct of meetings, small group communications and Brain storming, Decision making, How to make right decision, Conflicts and cooperation, Dissatisfaction: Making them productive.

## Unit-III

Proactive Manager: How to become the real you: The journey of self-discovery, the path of self-discovery, Assertiveness: A skill to develop, Hero or developer, Difference between manager and leader, Managerial skill check list, team development, How to teach and train, time management, Stress management, Self assessment.

## Unit-IV

Attitudinal Change: Meaning of attitude through example, benefits of positive attitude, how to develop habit of positive thinking, what is fear? How to win it? How to win over failure? How to overcome criticism? How to become real you? How to Motivate?

## Unit-V

Creativity – a managerial skill, Trying to get a grip on creativity.  
Overview of Management Concepts: Function of Management: Planning, organizing, staffing, controlling.

## Text & Reference Books:

1. Basic Managerial skills for all by E.H. McGrawth, Prentice Hall India Pvt Ltd,2006
2. How to develop a pleasing personality by Atul John Rego, Better yourself bools, Mumbai, 2006
3. The powerful Personality by Dr. Ujjawal Patni & Dr. Pratap Deshmukh, Fusion Books, 2006
4. How to Success by Brian Adams, Better Yourself books, Mumbai, 1969