Chhattisgarh Swami Vivekanand Technical University , Bhilai

Scheme of Teaching & Examination

BE III Semester Biotechnology

S. No	Board of Study	Subject Code	Subject	Period per week			Scheme of Exam Theory/Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Biotechnology	318311(18)	Microbiology	4	0	-	80	20	20	120	4
2	Biotechnology	318312(18)	Biochemistry	4	0	-	80	20	20	120	4
3	Biotechnology	318313(18)	Fundamentals of Genetics	3	1	-	80	20	20	120	4
4	Biotechnology	318314(18)	Bio Physics	3	1	-	80	20	20	120	4
5	Appl. Chemistry	318315(11)	Chemistry of Natural Products	3	1	-	80	20	20	120	4
6	Chem. Engg	318316(19)	Heat and Mass Transfer Operation	4	1	-	80	20	20	120	5
7	Biotechnology	318321(18)	Microbiology Lab	-	-	3	40	-	20	60	2
8	Biotechnology	318322(18)	Biochemistry Lab	-	-	3	40	-	20	60	2
9	Appl. Chemistry	318323(11)	Chemistry of Natural Products Lab	-	-	3	40	-	20	60	2
10	Chem. Engg	318324(19)	Heat and Mass Transfer Operations Lab	-	-	3	40	-	20	60	2
11	Humanities etc.	300325(46)	Value Education	-	-	2	-	-	40	40	1
12			Library	-	-	1					
			Total	**21**	**4**	**15**	**640**	**120**	**240**	**1000**	**34**

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

Note : Duration of all theory papers will be of **Three Hours.**

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

Semester : III Semester B.E **Branch: Biotechnology**
Subject: Microbiology Code: 318311(18)
Total Theory Periods: 40. Total Tut Periods: Nil
Total Marks in End Semester Exam: 80
Minimum number of class test to be conducted: 2

Unit 1:- History and development of Microbiology, types of microorganisms, microscopy, morphology of prokaryotes and eukaryotes (bacteria, cyanobacteria, algae, fungi, protozoa, viruses). Microbial taxonomy.

[No. of Period – 8]

Unit 2:- Microbial Nutrition– growth and cultivation of microorganisms in different media, growth curve, measurement of growth, different factors affecting growth.

Pure culture and isolation techniques.

Sterilization– physical and chemical agents, their mode of action on microorganisms.

[No. of Period – 8]

Unit 3:- Microbial Metabolism– metabolic pathways and bioenergetics. Principles of microbial nutrition, aerobic and anaerobic growth, process of N_2 fixation by microorganisms, microbial photosynthesis.

[No. of Period – 8]

Unit 4:- Microbial Diseases– mechanism of microbial pathogenicity. Mode of action of antimicrobial drug, chemotherapy.

Diseases caused by bacteria and Viruses – T.B., STD, AIDS, malaria, hepatitis.

[No. of Period – 8]

Unit 5:- Environmental Applications of Microbes– Recycling of biomaterial, production of biogas, biofertilizers and biopesticides.

[No. of Period – 8]

Name of Text Books:

1. Microbiology by Pelzor, Chan & Kreig [1986] Mc Graw Hill.
2. Microbiology by Presscott, Harley & Klein [1986] William C. Brown press.

Name of Reference Books:

1. Foundation of Microbiology by K.P. Talaro & A. Talaro, IIIrd edition, W.C.B. Mc grow Hill [1999].
2. An Introduction to Microbiology by P. Tauro, K.K. Kapoor and K.S. Yadav
3. Microbiology and Biotechnology by D.P. Singh and S.K. Dwvedi
4. Industrial Microbiology by L.E. Casida
5. Intriduction to soil and Agricultural Microbiology by G. Prabakaran

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

Semester : III[rd] Semester B.E **Branch: Biotechnology**

Subject: Biochemistry Code: 318312(18)

Total Theory Periods: 40. Total Tut Periods: 10

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Unit1:- Biomolecules– structure and function. Carbohydrates– simple sugars and polysaccharides, complex polymers and glycoprotiens. Fatty acid structure and chemistry, complex lipids, cholesterol and steroids. Protein structure, nomenclature and function.

[No. of Period – 8 + 2]

Unit 2:- Metabolism of carbohydrate– TCA cycle, glycolysis, gluconeogenesis, Shunt–Pentose Phosphate Pathway, Embden-MeyerHoff Pathway, Urea Cycle, interconnection of pathways. Electron Transport System and energy rich compounds.

[No. of Period – 8 + 2]

Unit 3:- Biochemistry of nucleic acid– DNA, RNA, nucleotides and nucleosides.

[No. of Period – 8 + 2]

Unit 4 :- Biochemistry of water, acids and base. Importance of buffer in cellular homeostasis and pH regulation. Henderson–Hasselbatch equation.

Enzymes– concept of ligands, enzyme binding action. activation energy, Michaelis-Menten equation.

[No. of Period – 8 + 2]

Unit 5:- Medical Biochemistry- plasma proteins in diagnosis of Disease, liposomes as carriers of drugs and enzymes, abnormalities of cell membrane fluidity in disease state, disease caused due to loss of membrane transport systems, genetic abnormalities in lipid-energy transport and protein malnutrition

[No. of Period – 8 + 2]

Name of Text Books:

1. A. L. Lehringer, D.L. Nelson, M.M. Cox- "Principles of Biochemistry by Werth Publishers, 2000.
2. L. Stryer, J.M. Berge, J.L. Tymoezko-"Biochemistry "W.H. freeman & Co. 2002.

Name of Reference Books:

1. D. Voet, G. Voet – "Biochemistry" John wiley & sons 1994.
2. Text Book of Biochemistry with Clinical Correlations bt Thomas M. Devlin (fourth Edition), Ley-Liss sons, Inc publication
3. A Text Book of Medical Biochemistry by R. L. Nath
4. Biochemistry by Mathew *et al.*
5. Instant notes of Biochemistry by B.D. Hames and N.M. Hooper

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

Semester : III[rd] Semester B.E **Branch: Biotechnology**

Subject: Fundamentals of Genetics Code: 318313(18)

Total Theory Periods: 30. Total Tut Periods: 10

Total Marks in End Semester Exam: 80

Minimum number of class test to be conducted: 2

Unit 1:- Classical Genetics- Mendels laws, monohybrid and dihybrid cross. Interaction of genes-linkage, crossing over, multiple alleles, lethal alleles. Genotypes and phenotypes. Chromosome Theory Of Inheritance, sex chromosomes, autosomes, karyogram, ideogram, sex determination

[No.of periods – 6+2]

Unit 2:- Genetic Material– DNA as a genetic material. Structure of DNA, RNA. Organization of DNA in chromosomes, nucleosome model, structure and function of chromosomes. Special types of chromosomes. Prokaryotic and eukaryotic chromosome. Genes, histone and non-histone proteins. Replication of DNA.

[No.of periods – 6+2]

Unit 3:- Chromosomal abarations, mutation– mutants, mutagenic compounds. Types of mutations, Mutagen Ames Test, gene mapping.
Markers– RFLP, AFLP, RAPD, microsatallite.

[No.of periods – 6+2]

Unit 4:- Genetic Disorders- sex linked disorders, disorders due to chromosomal changes, disorders due to mutation and tumor suppressing genes. Haemophilian disease. Genetic diseases in Human.

[No.of periods – 6+2]

Unit 5:- Genes- function and regulation. Transcription, translations. Regulation of gene expression– Lac Operon model, hormonal control in Eukaryotes. Genetic code. Hypothesis of gene action- one gene one enzyme theory, one-gene one-protein, one-gene one-polypeptide theory.

[No.of periods – 6+2]

Name of Text Books:

1. Gardner E.J., simonons M.J., Slustad D.P., "Principles of Genetices , 1991
2. Benjamin Lewin "Genes VII" oxpord university pres, oxford New York 1994.

Name of Reference Books:

1. Goodentugh U, "Genetics", Hold saemders International 1985.
2. Williams S. Klug, Michael R., " CummingsConcepts of Genetics", Pearson Education (7th Edition)
3. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P.S. Verma and V.K. Agrawal.
4. Gene Regulation by C. B. Powar
5. Genetics by Arora and Mohan
6. Genetics by Strickberger

Chhattisgarh Swami Vivekanand Technical University,

Bhilai (C.G.)

Semester : III Semester B.E **Branch: Biotechnology**

Subject: Bio-Physics Code: 318314(18)

Total Theory Periods: 30. Total Tut Periods: 10

Total Marks in End Semester Exam: 80

Minimum no of class test to be conducted: 2

Unit 1:- Newton's laws, stress, strain, elasticity, Hook's law, Viscosity, Newtonian and Non-Newtonian fluids. Velocity and pressure of blood flow resistance against flow.

[No. of Period –6+2]

Unit 2:- Cardiac Mechanics– cardio vascular system mechanical properties of blood vessels (Arteries, Arterioles, Capillaries, veins). Prosthetic heart valves.

[No. of Period –6+2]

Unit 3:- Respiratory Mechanics– alveoli mechanics, interaction of blood & lung, PV curve of lung. Breathing mechanism. Physics of lung diseases.

[No. of Period –6+2]

Unit 4:- Tissues– structure, function and mechanical properties of skin , ligaments. Pseudo– elasticity, visco-elasticity.

[No. of Period –6+2]

Unit 5:- Bones and Cartilages– Mechanical properties of cartilages and bones. Lubrication of joints. Diffusion properties of articular cartilages.

[No. of Period –6+2]

Name of Text Books:

1. A Text Book of Biophysics by R N Roy
2. Basic Biophysics by Daniel

Name of Reference Books:

1. Biotechnology, Molecular Biology and Biophysics by Mahesh
2. Essentials of Biophysics by P. Narayanan

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

Semester : III Semester B.E **Branch: Biotechnology**

Subject: Chemistry of Natural Products Code: 318315(11)

Total Theory Periods: 40 Total Tut Periods: Nil

Total Marks in End Semester Exam: 80

Minimum no of class test to be conducted: 2

Unit 1:- A study of plant constituents with reference to classification, isolation and identification. Volatile oils- classification and nomenclature of terpenes, general methods of structure elucidation of terpenes. Structure determination of citral and citronellol, menthol and camphor

[No. of Period –8]

Unit 2:- Alkaloids: Classification, isolation and general methods for structure investigation, structure elucidation of ephedrine and atropine

Study of ephedra and cinchona. Structure of uric acid and caffeine.

Tannins: general chemistry of tannins

[No. of Period –8]

Unit 3:- Proteins- structure of peptides, partial and complete hydrolysis of polypeptides, determination of amino acid sequences. Study of gelatin, papain and hyaluronidase.

[No. of Period –8]

Unit 4:- Lipids- general chemistry of lipids. Study of following drugs- castor, olive, coconut.

[No. of Period –8]

Unit 5:- Study of following drugs with reference to sources, preparation, constituents and uses- honey, starches and dextrin

Vitamins- chemistry and structure determination of thiamine, riboflavin, ascorbic acid, vitamin A

[No. of Period –8]

Name of Text Books:

1. Chemistry of Natural Products by P. S. Kalsi, Kalyani Publishers
2. Organic Chemistry of Natural Products (Vol I & Vol II) by Chatwal, Himalayan Publishers

Name of Reference Books:

1. Synthetic Drugs by Chatwal, Himalayan Publishers
2. Advance Practical Organic Chemistry by Jagmohan (Vol I & Vol II), Himalayan Publishers
3. Text Book of Organic Chemistry by P. L. Soni, Sultan Chandra and Sons
4. Text Book of Organic Chemistry by M. K. Jain, Sultan Chandra and Sons

Chhattisgarh Swami Vivekanand Technical University,

Bhilai (C.G.)

Semester : III Semester B.E **Branch: Biotechnology**

Subject: Heat and Mass Transfer Operation Code: 318316(19)

Total Theory Periods: 40 Total Tut Periods: Nil

Total Marks in End Semester Exam: 80

Minimum no of class test to be conducted: 2

Note: This course work is to cover principles, equipments and simple problems

Unit 1:- **BASIC CONSIDERATIONS OF CONDUCTION:** Modes of heat transfer, Fourier's law, Newton's law, Stefan-Boltzmann's law. Thermal conductance and resistance, Heat transfer by conduction-concept, general heat conduction equation, thermal diffusivity and equivalent thermal conductivity, linear one - dimensional steady state conduction through plane, cylinders, spheres and composite walls, heat conduction with internal heat generation, systems with variable thermal conductivity, critical radius of insulation, heat conduction with extended surfaces

[No. of Period – 8]

Unit 2:- **CONVECTIVE HEAT TRANSFER AND PHASE THEORY:** Heat transfer co-efficient, forced convection in tubes and submerged bodies free convection, dimensional analysis and empirical correlation , physical significance of dimensionless groups, critical thickness of insulation for cylindrical and spherical surfaces, concept of hydrodynamic and thermal boundary layers.

[No. of Period – 8]

Unit 3:- **MASS TRANSFER- DIFFUSION:** Molecular and eddy diffusion in fluids, Measurements and calculation of diffusivity, mass transfer coefficient and their co relations, analogies in transfer process Theories of mass transfer in packed and fluidized beds

[No. of Period – 8]

Unit 4:- **DISTILLATION:** Distillation and vapor liquid equilibrium , boiling point diagram partial vaporization and condensation and relative volatility flash distillation and differential distillation for two component mixture, steam distillation, azeotropic distillation and extractive distillation

[No. of Period – 8]

Unit 5:- **ABSORPTION:** Packed tower principle of absorption, two film theory, over all coefficients, H.T.U. Method absorption with chemical reaction

Name of Text Books

1. McCabe and Smith, Unit Operation of Chemical Engg
2. Coulson and Richardson, Chemical Engineering, vol 1.

Name of Reference Books:

1. Treyball, Mass Transfer Operation

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

Semester : III Semester B.E **Branch: Biotechnology**

Subject: Microbiology Lab Practical Code: 318321(18)

Total Practical Periods: 30

Total Marks in End Semester Exam: 40

Experiments to be performed (minimum 10 experiments)

1. General precautions and safety measures in Microbiology Lab.
2. Study of working principle of Microscope / Laminar flow/ Autoclave.
3. Preparation of Culture Media.
4. Isolation of microorganisms from soil.
5. Isolation of microorganisms from air.
6. Isolation of microorganisms from water.
7. Pure culture isolation techniques.
8. Gram staining of bacteria.
9. Simple staining using acidic/basic stains
10. Staining of fungal cell and Identification.
11. Antibiotic sensitivity test.
12. Standard analysis of drinking water.
13. Determination of optimum temperature for growth
14. Determination of thermal death temperature and thermal death time
15. Effect of pH on growth of bacteria

List of Equipments/Machine Required:

1. Autoclave
2. Hot Air Oven
3. Laminar Air Flow
4. Microscope
5. Water Bath
6. Colony Counter
7. Digital Balance
8. Rotating Incubator
9. BOD Incubator
10. Distillation Unit

Recommended Books:

1. Practical Microbiology- Principles and Techniques by Vinita Kale and Kishore Bhusari
2. Refer Books mentioned in theory syllabus

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

Semester : III Semester B.E **Branch: Biotechnology**

Subject: Biochemistry Lab Practical Code: 318322(18)

Total Practical Periods: 30

Total Marks in End Semester Exam: 40

Experiments to be performed (minimum 10 experiments)

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

List of Equipments/Machine Required:

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

Recommended Books:

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

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

Semester : III Semester B.E **Branch: Biotechnology**

Subject: Chemistry of Natural Products Lab Practical Code: 318323(11)

Total Practical Periods: 30.

Total Marks in End Semester Exam: 40

Experiments to be performed (minimum 10 experiments)

1. Extraction of caffeine from tea leaves
2. Extraction of Cystein from human hair
3. Separation of amino acids by chromatography
4. Separation of dyes by chromatography
5. Separation of dyes seuffs by chromatography
6. Identification of functional group in given organic compound (carboxylic acid, amide, phenolic)
7. Identification of given organic compound (acetamide, benzamide, urea)
8. Identification of given organic compound (glucose, fructose, sucrose and starch)
9. Identification of given organic compound (phenol, resorcinol, alpha-naphthol, beta-naphthol)
10. Identification of functional group in given organic compound (carbohydrate, aldehyde and ketone)
11. Preparation of oxalic acid from sucrose (cane sugar) by oxidation with conc. HNO_3
12. Preparation of p-bromoacetanilide from acetanilide (bromination)
13. Preparation of m-dinitrobenzene from nitrobenzene (nitration)
14. Preparation of acetylsalicylic acid from salicylic acid (acetylation)

List of Equipments/Machine Required:

1. Electric water bath
2. Thin layer chromatographic apparatus
3. Paper chromatographic apparatus
4. Column chromatographic apparatus
5. Digital balance
6. Hot plate
7. Electic oven
8. Magnetic stirrer
9. Soxlet extraction apparatus

Recommended Books:

1. Advance Practical Organic Chemistry by Jagmohan (Vol I & Vol II), Himalayan Publishers
2. Organic Chemistry of Natural Products (Vol I & Vol II) by Chatwal, Himalayan Publishers
3. Refer books mentioned in theory

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

Semester : III[rd] Semester B.E **Branch: Biotechnology**

Subject: Heat and Mass Transfer Operation Lab Practical Code: 318324(19)

Total Practical Periods: 30

Total Marks in End Semester Exam: 40

Experiments to be performed (minimum 10 experiments)

1. To determine the heat transfer coefficient of double pipe heat exchanger for co-current flow.
2. To determine the heat transfer coefficient of a double pipe heat exchange for counter current flow.
3. Determination of thermal conductivity of insulating powder by Spherical Method
4. To determine the total thermal conductivity and the thermal resistance of given compound resistance in series by slab system
5. To determine the heat transfer coefficient of shell and tube heat exchanger
6. To study the temperature distribution along the length of pin fin in natural convection
7. To study the temperature distribution along the length of pin fin in forced convection
8. To determine the Diffusivity coefficient of Acetone in air by natural diffusion.
9. To determine the rectification characteristics of binary liquid system.
10. Study of Bubble cap distillation column.
11. Study of absorption Column.
12. Study of Wetted Wall Column.
13. To determine the diffusivity of Acetone by forced diffusion.
14. To study the characteristics of steam distillation.
15. Study of fluidized bed system.

List of Equipments/Machine Required:

1. Double pipe heat exchanger
2. Shell & tube heat exchanger
3. Pin fin
4. Bubble cap distillation column
5. Absorption Column
6. Wetted Wall Column
7. Fluidized bed system.

Recommended Books:

1. McCabe and Smith, Unit Operation of Chemical Engg
2. Gavahne Unit operation Chemical Engineering,.
3. Treyball, Mass Transfer Operation

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Semester : B.E. 3rd Sem.
Branch : Common to all Branches
Subject : **Value Education**
Code : 300325 (46)
No. of Periods : 2 pds/week
Tutorial Periods : NIL
Total Marks in End Semester Exam. : NIL
Teacher's Assessment: 40 Mks
Minimum number of class test to be conducted : Two

Unit – I

- **STUDY OF BASIC HUMAN OBJECTIVES :** Everlasting solution ¼lek/kku½] prosperity ¼le`f)½] trust in self and others ¼vHk;½] and coexistence ¼lgvfLrRo½ for balance in nature. Need and importance of aforesaid basic human objectives and how to achieve these.

Unit – II

- **CONCEPT AND UNDERSTANDING OF HUMAN HAPPINESS**
  Meaning and concept of "happiness", incessant happiness, its relationship with gaurantee of physical needs, comforts, physical and sensory pleasures with its transient nature, misery; The only method to minimize incessant happiness : gaining right understanding about oneself, one's body, one's relationship with other human beings, Nature and total existence.

Unit – III

- **PROPER UNDERSTANDING** about the order in Nature ¼O;oLFkk½ and co-existence ¼lgvfLrRo½ at various levels, such as, I and my body, family, society, Nature and existence.
- **UNDERSTANDING THE SELF :** Understanding human reality – I and my body, present understanding of the self, physical needs, relation with others and with Nature, gaining proper understanding of the self, discrimination between 'I' and my 'body', characteristics and the needs of 'I', of my 'body' and 'body' & 'I'.

Unit – IV

- **SYNERGATIC ORDER ¼O;oLFkk½ and COEXISTENCE ¼lgvfLrRo½ among HUMANS, IN NATURE & IN EXISTENCE** :

- Conceptual understanding of natural relations and consequent values, of family and relation therein, of society and role of engineers therein, overall excellence' : concept, its universal parameters and total human behaviour
- Inanimate ¼tM+½ and consciousness ¼pSrU;½ aspects of Nature, Four distinct synergetic orders in Nature
- Padaarth Awastha ¼inkFkZ voLFkk½] Pran Awastha ¼izk.k voLFkk½] Jiv Awastha ¼tho voLFkk½] and Gyan Awastha ¼Kku voLFkk½] complementary supplementary evolutionary connection amongst above orders, identifying and implementing "Appropriate Technology".
- Synergetic order among interacting entities of Nature operating in all pervading changeless Shunya or Satta, Indivisible interconnectedness of Satta and Prakriti and its implications.

Unit – V

- **IMPLICATIONS OF PROPER UNDERSTANDING**

- Awakening ¼tkx`fr½] the common goal of all human beings,
- promotion and perseverance of synergetic order and co-existence at all levels leading to incessant happiness.
- Natural manifestation of universal human values and thereby incessant happiness
- Undivided Society ¼vfoHkkT; lekt½ and Universal Organised System ¼lkoZHkkSe O;oLFkk½
- Transition from synergetic disorder ¼vO;oLFkk½ to synergetic order ¼O;oLFkk½
- Evaluation of Understanding, work and behaviour.

REFERENCES

1. Jeevan Vidya Camp ¼f'kfoj½ notes
2. An Introduction to Jeevan Vidya by Shri A. Nagaraj

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