

Chhattisgarh Swami Vivekanand Technical University, Bhilai

SCHEME OF TEACHING & EXAMINATION VIII Sem 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	318831(18)	Industrial Biotechnology	3	1	-	80	20	20	120	4
2	Biotechnology	318832(18)	Food Processing Technology	3	1	-	80	20	20	120	4
3	Biotechnology	318833(18)	Agriculture Technology	4	1	-	80	20	20	120	5
4	Refer Table III		Professional Elective III	4		-	80	20	20	120	4
5	Refer Table IV		Open Elective	4							4
6	Biotechnology	318861(18)	Industrial Biotechnology Lab	-	-	3	80	20	20	120	2
7	Biotechnology	318862(18)	Food Processing Technology Lab	-	-	3	40	-	20	60	2
8	Biotechnology	318863(18)	Agriculture Technology Lab	-	-	3	40	-	20	60	2
9	Biotechnology	318864(18)	Major Project	-	-	3	40	-	20	60	3
10	Biotechnology	318865(18)	Report writing and Seminar	-	-	2	40	-	20	60	1
11			Library		-	1					
			Total	18	3	13	640	120	240	1000	30

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.

Professional Elective Table III

S.No	Board of Studies	Subject Code	Subject
1	Biotechnology	318841(18)	Bioentrepreneurship
2	Biotechnology	318842(18)	Clinical Research and Trial Management
3	Biotechnology	318843(18)	Cellular and Molecular Diagnostics

Table IV Open Elective

Open Elective –IV		
S.No. Board of Studies	Code	Name of Subject
Management	300851(76)	Enterprise Resource Planning
Information Technology	300852(33)	E-Commerce & strategic IT
Management	300853(76)	Technology Management
Information Technology	300854(33)	Decision Support & Executive Information system
Computer Science & Engg.	300855(22)	Software Technology
Management	300856(76)	Knowledge Entrepreneurship
Management	300857(76)	Finance Management
Management	300858(76)	Project Planning, Management & Evaluation
Mechanical Engg.	300859(37)	Safety Engineering
Computer Science & Engg.	300801(22)	Bio Informatics
Mechanical Engg.	300802(37)	Energy Conservation & Management
Nanotechnology	300803(47)	Nanotechnology
Management	300804(76)	Intellectual Property Rights
Mechanical Engg.	300805(37)	Value Engineering
Civil Engg.	300806(20)	Disaster Management
Civil Engg.	300807(20)	Construction Management
Civil Engg.	300808(20)	Ecology and Sustainable Development
Chem. Engg.	300809(19)	Non Conventional Energy Sources
Electrical Engg.	300810(24)	Energy Auditing and Management
Mechanical Engg.	300811(37)	Managing Innovation & Entrepreneurship
Information Technology	300812(33)	Biometrics
Information Technology	300813(33)	Information Theory & Control
Computer Science & Engg.	300814(22)	Supply Chain Management
Computer Science & Engg.	300815(22)	Internet & Web Technology

Electrical Engg.	300816(24)	Electrical Estimation and Costing
Electrical& Electronics Engg.	300817(25)	Non Conventional Energy Sources

Note (1) – 1/4th of total strength of students subject to minimum of twenty students is required to offer an

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

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

Name of programs:	Bachelors of Engineering	Semester:	VIII
Branch:	Biotechnology	Code:	318831(18)
Subject:	Industrial Biotechnology	Total Tut Periods:	10
Total Theory Periods:	30	Assignments:	Two (Minimum)
Class test:	Two (Minimum)	Maximum Marks: 80	Minimum Marks: 28
ESE Duration:	Three Hours		

Course Objectives:

1. To impart the knowledge about the practical aspect of the course in different fields towards the welfare of the society.
2. To make the students understand about the importance of application of biotechnology in industry.

- UNIT I** Definition and introduction of industrial biotech; Basics of different field of biotech: genetic engineering, fermentation, plant tissue culture, animal biotechnology, environment, etc; Introduction of bioprocess and fermentation technology: primary and secondary metabolite- principles and methods.
- UNIT II** Raw material: availability, quality, processing; Role of microbes regulation of microbial catabolic and anabolic processes, induction nutritional repression, carbon catabolite repression, feedback inhibition, feedback repression.
- UNIT III** Principles and characteristics of bioprocess, Cell disruption for product release , mechanical and enzymatic and chemical methods , Pretreatment and stabilization of byproducts.
- UNIT IV** Adsorption , Solid liquid separation , Aqueous two phase extraction , Membrane separation , Filtration , reverse osmosis , Dialysis ,Precipitation of protein by different methods .
- UNIT V** Industrial waste recycling, bio-waste management, standard norms of disposal of industrial waste; drying, crystallization in final product formulation, Industrial product packaging, transport and marketing

Books:

1. Biotechnology, (2006) Satyanarayana, U., Books and Allied (P) Ltd.
2. Microbiology, (2000) M. J. Pelczar and E.C.S. (Jr) Chan, Tata McGrawHill, Pub.Co.New"Delhi, 5th ed, 1986, digitized on july-2008.

Reference Books:

1. Principles of Fermentation Technology, Peter F Stanbury.
2. Bioprocess Engineering, (1992) Shuler and Kargi, Prentice Hall.
3. Biochemical Engineering, Harvey W Blanch.
4. Biochemical Engineering, Aiba & Humphrey.
5. Fundamentals of Biochemical Engineering, Bailey & Ollis.
6. Biochemical Engineering, James Lee.

Course Outcome:

1. The course will help the students to basic knowledge of applying the bioprocess principles in industry such as biofertilizers, etc.
2. This will also enlighten them with various therapeutic interventions and innovative ideas towards industrial research in many fields like medicine, food processing, environment etc.

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

Name of program: **Bachelors of Engineering**

Branch: **Biotechnology**

Subject: **Food Processing Technology**

Semester: **VIII**

Code: **318832(18)**

Total Theory Periods: **30**

Total Tut Periods: **10**

Class test: **Two (Minimum)**

Assignments: **Two (Minimum)**

ESE Duration: **Three hours**

Maximum Marks: **80** Minimum Marks: **28**

Course Objectives:

1. To provide an overview of the food processing industry.
2. To introduce the students with issues such as food safety and nutrition, causes and control of food poisoning and spoilage, diet and health, food laws and regulations, as well as the manufacture of some of the common food products.

UNIT I **Food Chemistry:** Food quality characteristics; Composition and nutritive value of common foods, Structure, properties and metabolic function of food constituents viz., water, carbohydrates, lipids, proteins, enzymes, vitamins, minerals, pigments, colors and flavoring substances; Undesirable constituents in foods; Changes in food constituents during processing and storage.

UNIT II **Food Microbiology:** Microbial groupings and identification; Nutrient requirements for bacterial culture; Growth and inactivation kinetics; Harmful and beneficial effects of microbes, microbes in food industry; Microbiology of water, milk, meat, vegetables; Food spoilage, poisoning and intoxication.

UNIT III **Food Process Principles:** Basic principles of food preservation and processing; Food packaging ,Canning, chilling, freezing, dehydration ;Preservation of food by removal or supply of heat, dehydration, irradiation, addition of chemicals and fermentation; CA/MA storage; Water activity and food stability.

UNIT IV **Technological processes for industrial manufacture of selected foods of commercial importance from plants and animal sources:** Animal products processing: Drying and canning of fish, tenderization and freezing of meat, egg powder, Fruits, vegetables and plantation products processing: Extraction, clarification concentration and packaging of fruit juice; Production of jam, jelly, marmalade, squash, candies, and pickles, pectin from fruit waste, tea, coffee, chocolate and essential oils from spices; Margarine, Bakery and Confectionery products; Textured plant protein; Breakfast cereals ; Milk and milk products processing: Pasteurized and sterilized milk, cream, butter, ghee, ice-cream, cheese and milk powder;

UNIT V **Food Laws and Standards:** Food additives; Quality control in food industry; Chemical safety measurement: Heavy metal, fungal toxins, bacterial toxins, herbicide, Pesticide; Detection, Quality control tests explained in brief.

Textbooks:

1. Modern Food Microbiology, (1987), Jay, CBS Publishers.
2. Food Microbiology, Frazier

References books:

1. Prescott and Dunn's Microbiology, (1987) G. Reed, CBS Publishers.
2. Technology of food preservation, Desrosier, CBS Publisher

Course Outcome:

1. The students will become familiar with the major constituents of food and their function and also will know the major causes of food poisoning and spoilage.
2. They will have proficient knowledge of the major processes used in food preservation, food packaging and food industry.

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

Name of program: **Bachelors of Engineering**

Branch: **Biotechnology**

Subject: **Agriculture Technology**

Total Theory Periods: **40**

Class test: **Two (Minimum)**

ESE Duration: **Three hours**

Semester: **VIII**

Code: **318833(18)**

Total Tut Periods: **10**

Assignments: **Two (Minimum)**

Maximum Marks: **80** Minimum Marks: **28**

Course Objectives:

1. To give the students a clear knowledge of current scenario of agriculture and rural development.
2. To make the students learn different agricultural techniques.

UNIT I Introduction to agriculture; Indian agriculture: history; Crops, classification, general principles of crop production and introductory agronomy; Soil, characteristics, types, importance; Agriculture and biotechnology: artificial seeds, genetically modified crops, virus free plants, micropropagation, development of hybrids.

UNIT II Soil microbiology: useful and harmful microorganisms, their importance; Diseases: disease classification, causal agent, effect of disease, disease control; Crop management: nutrition, weeding, irrigation, types, scheduling of irrigation and fertilizers

UNIT III Soil conservation and water Harvesting: Soil erosion, causes, effects, methods of erosion control, Crop mixing and crop rotation, strip Cropping, etc.; Water harvesting; importance, methods, farm pond, percolation pond, dry farming techniques for improving crop production.

UNIT IV Crop harvesting, methods; post harvesting techniques: importance, drying, cleaning, grading, shelling, milling; Storage, purpose, types, loss in storage, methods, packaging, types, packaging methods and materials, techniques.

UNIT V Applied agriculture: horticulture, methods, regions and crops; sericulture; apiculture; floriculture; pisciculture; Agricultural economics: Nature and scope of agricultural and its role in economic development, employment, Sustainable agriculture and organic farming, Use of land, water and energy and other demands, production supply and capital formation; Agribusiness: planning, motivation, communication, leadership, formulation; Biofuel cropping system.

Text Books:

1. A History of Agriculture in India Vol.I to IV , M.S. Randhawa, 1980-1986, Indian Council of Agricultural Research, New Delhi.
2. Principles and Practices of Agronomy (2001) P. Balasubramanian and S.P. Palaniappan AgroBios (India) Ltd., Jodhpur.

Reference Books:

1. Principles and Practices of Management (2005) L.M Prasad, Sultan Chand and Sons Educational Publishers, New Delhi.
2. Post harvest technology for Cereals, Pulses and oilseeds (2000) 3rd ed, A.Chakraverty, Oxford &IBH publication Pvt Ltd, New Delhi
3. Principles of Agronomy (1999) S.R. Reddy, Kalyani Publishers, Ludhiana.
4. The Nature and Properties of Soils (2002) 13th ed, N.C. Brady and R.R. Well, Pearson Education, Delhi.
5. Introduction to Soil and Water Conservation Engineering (2002) B. C.Mal, Kalyani Publishers, New-Delhi.

Course Outcome:

1. Clear knowledge of the subject will enable the students to develop innovative and advanced agricultural techniques.
2. Small scale industry/ business in the related area can be developed.

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

Name of programs: **Bachelors of Engineering**

Branch: **Biotechnology**

Subject: **Bioentrepreneurship**

Total Theory Periods: **40**

Class test: **Two (Minimum)**

ESE Duration: Three Hours

Semester: **VIII**

Code: **318841(18)**

Total Tut Periods:

Assignments: **Two (Minimum)**

Maximum Marks: **80** Minimum Marks: **28**

Course Objectives:

1. To develop the Creativity, responsibility, freedom to be able to decide what work one wants to do and how, dedication, diversity and last but not the least having fun and enjoying what one does.
2. To develop the entrepreneurial skill in the field of biotechnology and learn the Business strategy and Technology Transfer

UNIT I Introduction: Entrepreneurship, Definition; Factors necessary for Entrepreneurship: Attributes in an Entrepreneur; Bioentrepreneurship; Building of a Bioentrepreneur; Indicators of Bio entrepreneurship

UNIT II Components of a Biotech company: History of establishment of pioneer biotechnology companies, key for success, Mission and Strategy; Paths for starting new Biotech ventures, product selection for new Biotech venture; Successful Bioentrepreneur in India.

UNIT III Biotech Business Models: Vertical model, Product Model, Platform Business Model, Hybrid Model, Service Business Model from Genomics based companies.

UNIT IV Business Plan: General considerations: Business plan - Do's and don'ts, How to write Business proposal, Checklist for Business proposal writing: Deficiencies in startup Business Plan.

UNIT V Business Strategies and Technology Transfer: Intellectual property in biotech: Licensing, Accessing University technology, Licensing of Biotechnological invention, funding agencies in India

Textbooks:

1. Entrepreneurship and Business of Biotechnology, (2007) S. N. Jogdand, Himalaya Publishing Home.
2. Entrepreneurship and Small Business Management, (1996) C. B. Gupta and S. S. Khanka.

References:

1. The coming biotech age: The business of biomaterials (2000) R Oliver, New York: McGraw Hill.
2. Bioethics, (2008) S. Shalesha. Wisdom educational service, Chennai.

Course Outcome:

1. At the end of the course, students will have sufficient systematic and comprehensive knowledge about basics of bio entrepreneurship which will help them relate to the different entrepreneurs of biotech industry and their management strategies.
2. It will also impart knowledge of setting a biotech based industry on a new scale with ideas to market the product.

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

Name of programs:	Bachelors of Engineering	Semester:	VIII
Branch:	Biotechnology	Code:	318842(18)
Subject:	Clinical Research and Trial Management	Total Tut Periods:	Nil
Total Theory Periods:	40	Assignments:	Two (Minimum)
Class test:	Two (Minimum)	Maximum Marks:	80
ESE Duration:	Three Hours	Minimum Marks:	28

Course Objectives:

- 1 To make the students familiar with the concept of clinical research and trials,
- 2 To make them aware of the regulations and ethical issues concerned with trials.

- UNIT I** Introduction, Basics of Clinical Research, good clinical practices, Indian and global perspective and guidelines
- UNIT II** Clinical trial and its processes, Types and Phases of clinical trial, Documentation and its management.
- UNIT III** Drug development and processes, Pharmacovigilence, Pre- clinical toxicity: types of toxicities, Regulations in clinical research and trial
- UNIT IV** Marketing of product, Post marketing surveillance- methods, Monitoring of treatment and outcome, Termination of trial.
- UNIT V** Ethical, legal and social issues for responsible clinical research.

Text books:

1. Handbook of clinical research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone c.
2. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

References:

1. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
2. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.

Course Outcome:

1. The students will be able to apply a better research in the related field with the knowledge acquired in the above course
2. Marketing knowledge will help the students to develop and maintain a better enterprise.

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

Name of program: **Bachelors of Engineering**
Branch: **Biotechnology**
Subject: **Cellular and Molecular Diagnostics**
Total Theory Periods: **40**
Class test: **Two (Minimum)**
ESE Duration: **Three hours**

Semester: **VIII**
Code: **318843(18)**
Total Tut Periods: **Nil**
Assignments: **Two (Minimum)**
Maximum Marks: **80** Minimum Marks: **28**

Course Objectives:

1. To give the students a clear knowledge of the diseases and severity of several medical conditions so that they can apply this knowledge in diagnosis and therapy.
2. To make the students aware of medico legal issues and other issues concerned with the diagnostics and the result confidentiality.

- UNIT I** **Disease:** classification, epidemiology, pathology, prognosis, molecular pathology, symptoms.
- UNIT II** **Procedure and protocols of laboratories:** chemical preparation, volumetric analysis, weighing and balancing, concept of solute and solvent, specimen collection preservation, transportation, specimen selection procedure.
- UNIT III** **General Function test:** liver function test, renal function test, reproductive endocrine function test, thyroid function test; Principle of diagnostic enzymology; Biochemical tests for electrolytes, toxic chemicals biomolecules, etc.
- UNIT IV** **Diagnosis:** Molecular techniques: PCR, RFLP, SSCP, Microarrays, FISH, In-situ hybridization, blotting techniques; Cytogenetic diagnosis; Immunodiagnosics: Antigen-Antibody Reactions, Antibody Production, Enzymes and Signal Amplification Systems, electrophoresis, etc; Antibody markers, CD Markers, FACS, HLA typing, Bioassays, biosensors, biochips.
- UNIT V** Advantages and disadvantages; Medico-legal issues; Confidentiality; Result display and counseling of the affected individual, documentation, Therapy.

Text Books:

1. Essentials of Human Disease (2011) Leonard V. Crowley, Jones & Bartlett Publishers.
2. The Biology of Disease (2001) Jonathan Phillips, Paul Murray & Paul Kirk, Blackwell Scientific.

Reference Books:

1. Tietz Textbook of Clinical Chemistry, Carl A. Burtis, Edward R. Ashwood, Harcourt Brace & Company Aisa Pvt. Ltd.
2. Commercial Biosensors (1987) Graham Ramsay, John Wiley & Son, INC.
3. Essentials of Diagnostic Microbiology, Lisa Anne Shimeld.
4. Diagnostic Microbiology, Balley & Scott's.
5. Tietz Text book of Clinical Biochemistry, Burtis & Ashwood.
6. The Science of Laboratory Diagnosis, Crocker Burnett.
7. Human Molecular Biology (2003) Richard Epstein, Cambridge University Press.

Course Outcome:

3. The students will be able to conduct a better research in the related field with the knowledge acquired in the above course
4. The diagnosis will help in development of advanced therapeutic methodologies.

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

Name of program: **Bachelors of Engineering**
Branch: **Biotechnology**
Subject: **Industrial Biotechnology Lab**
Total Lab Periods: **36**
Maximum Marks: **40**

Semester: **VIII**
Code: **318861(18)**
Batch Size: **15**
Minimum Marks: **28**

List of Experiments:

1. Batch cultivation, estimation of k_{la} – dynamic gassing method, exhaust gas analysis – carbon
a. Balancing, gas balancing.
2. Estimation of k_{la} – sulphite oxidation method.
3. Estimation of k_{la} – power correlation method.
4. Residence time distribution.
5. Estimation of overall heat transfer coefficient.
6. Enzyme Decay (Reactivity with time).
7. Solid liquid separation – centrifugation, microfiltration
8. Cell disruption techniques – ultrasonication, French pressure cell
9. Cell disruption techniques – dyno mill – batch and continuous
10. Precipitation – ammonium sulphite precipitation

Requirements:

Same as required in microbiology lab.

Recommended books:

1. An introduction to practical biotechnology 1st ed (2006), S.Harisha, Laxmi Publications (P) Ltd.
2. Refer Books mentioned in theory syllabus

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

Name of program: **Bachelors of Engineering**

Branch: **Biotechnology** Semester: **VIII**
Subject: **Food Processing Lab** Code: **318862(18)**
Total Lab Periods: **36** Batch Size: **15**
Maximum Marks: **40** Minimum Marks: **28**

List of Experiments:

1. Dehydration of fruits and vegetables: Effects of tray drying, freeze drying and pre-treatments.
2. Freezing processing: freezing and concentration of different foods; Effects of pre-treatments and freezing methods.
3. Can reforming, seaming and canning of fruits and vegetables.
4. Use of food enzymes.
5. Frozen storage of foods.
6. Pasteurization and sterilization of foods.
7. Thermal processing (Canning, Milk Processing (Milk Pasteurization)).
8. Preservation/ Non-thermal processes (Blanching-Freezing, Drying, High-pressure Processing).
9. Packaging with Plastics: Effects of packaging materials and methods on food qualities.
10. Packaging with Metal: Sealing of cans and inspection of double seam.

Requirements:

Centrifuge	Refractometer (Abbe, Portable etc)
Chromatography assembly:HPLC,TLC,Ion Exchange Chromatography	Refrigerator
Colony counter	Rheometer
Deep freezer	Rotary Evaporator
Hunter color lab	Shaking Incubator
Incubator	Sonicator
Kjeldahl apparatus	Soxhlet apparatus
Microscope	Titration assembly
Moisture Analyzer	UV-Vis Spectrophotometer
Oven	Viscometer
PCR system	Water activity meter
PH Meter	Weighing Balance (sensitivity according to the requirements)
Rapid Visco analyzer	Spray Drier
Tray Drier	Freeze Drier

Recommended books:

1. An introduction to practical biotechnology 1st ed (2006), S.Harisha, Laxmi Publications (P) Ltd.
2. Refer Books mentioned in theory syllabus

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

Name of program: **Bachelors of Engineering**

Branch: **Biotechnology**

Subject: **Agriculture Technology Lab**

Total Lab Periods: **36**

Maximum Marks: **40**

Semester: **VIII**

Code: **318863(18)**

Batch Size: **15**

Minimum Marks: **28**

List of Experiments:

1. Determination of moisture content of grains by oven method and moisture meter.
2. Preparation of pot mixture, potting and repotting.
3. Practicing propagation method- budding and grafting.
4. Practical training of weeding and pruning in horticultural crops.
5. Irrigation, fertilizer application and weed management practices.
6. Plotting and making design and layout.
7. Preparation of planting materials of major crops - Seed treatment
8. Study of litter decomposition and organic recycling.
9. Development of drip irrigation in the given plot.
10. Market Research and Segmentation.

Requirements:

1. Moisture meter
2. Oven
3. Sprayer
4. Agricultural tools

Recommended Books:

1. Cropping and Farming Systems (2003), S.C.Panda, Agrobios Publishers, Jodhpur
2. Irrigation Theory and Practice (1988), A.M.Michael, Vikas Publishing House Pvt. Ltd., New Delhi.
3. Plant propagation – Principles and Practices (1986), H.T. Hartman and D.E. Kester, Prentice Hall of India Ltd., New Delhi.