

# Chhattisgarh Swami Vivekananda Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Plant and Animal Biotechnology**

**Total Marks in End Semester Exam: 100**

**Minimum number of Class Tests: 2**

**Branch: Biotechnology**

**Course Code: C018611(018)**

**L: 3 T: 1 P: 0 Credits: 4**

## **Course Objective(s):**

- To impart knowledge of basics techniques of tissue culture.
- To design and learn strain-engineering strategies to alter cellular behavior, metabolic flux, and product formation.
- They will appreciate the vast industrial applications of metabolic engineering in the field of medicine, energy and environment.
- Learn about the traditional and new approaches used in crop improvement.
- Learn about the conventional and marker assisted breeding approaches, plant tissue culture and its importance in generation of transgenic plants.

## **UNIT-I Plant tissue culture**

- History, introduction, laboratory organization, plant growth hormone and aseptic manipulation, plasticity and totipotency.
- Sterilization methods used in plant tissue culture. Types of nutrient media and plant growth regulators in plant regeneration.
- Pathways for in vitro regeneration: organogenesis, somatic and gametic embryo genesis. Protoplast isolation.
- Culture and regeneration; culture of other explants, somatic hybridization; Haploid and triploid production and their applications. Genetic fidelity of plants raised through tissue culture.
- Methods for Plant Conservation, Cryopreservation, synseed production.

## **UNIT-II Principles and methods of genetic transformation**

- Introduction to Agrobacterium biology and biotechnology. Mechanism of T-DNA transfer to plants and Agro infection, A. rhizo genes and its application.
- Promoters used in plant vectors. Plant viral vectors, Molecular techniques for analysis of transgenics (copy number, transgenest ability, silencing; segregation).
- Marker-free transgenics and environmental, social and legal issues associated with transgenic plants.
- Case studies for geneticengineering in plants for traits of agronomic value, biotic, abiotic stresses and herbicide tolerance.

## **UNIT-III Application of Plant Tissue Culture**

- Application of tissue culture in horticulture and forestry: production of disease free plants; Industrial application of tissue culture.
- Germplasm conservation; modification of seed protein quality, suppression of endogenous gene, plant derived vaccines.
- Production of secondary metabolites/products: Insulin, growth hormones, interferons etc.

- Applications of micro-propagation, meristem culture, embryo rescue, somaclonal and androclonal variations, tissue culture for crop improvement.

#### **UNIT-IV Animal Cell Culture**

- History of Animal Cell Culture, Characteristics of animal cell, metabolism, regulation and nutritional requirements, Culture Media and Growth Conditions.
- Development of Primary Culture and Cell Lines, Suspension Culture, Characterization and maintenance of cell lines.
- Need for scaling-up of cells for vaccine or antigen or pharmaceutical protein production, Hybridoma Technology, Cell culture reactors.
- Scale-Up in suspension and monolayer cultures, Factors affecting cell growth, Growth Monitoring, Mass Transfer.

#### **UNIT-V Animal Biotechnology**

- Concept of transgenic animals, Methods of transgene delivery, Microinjection of recombinant DNA into fertilized eggs/stem cells.
- Cryopreservation, Common Cell Culture Contaminants, Marker Gene Characterization, Transfection and Transformation of Cells.
- Animal Pharming, Organ Culture, Regenerative Medicine, Human Embryonic Stem Cell research, Ethical Concerns and Biosafety.

#### **Text Books:**

1. Introduction to plant tissue culture, K.K Day.
2. Animal Cell Culture, John R.W. Masters, Oxford University Press.
3. Plant tissue Culture– Application 7 limitations (1990), S.S. Bhojwane Elsevier, Amsterdam.

#### **Reference Books:**

1. Micro propagation (1990) P.C. Degergh& R. H. Zommeronom Kluwer Academic Publ. Dordrecht.
2. Plants, genes & crop improvement, (2002), Crispeels ASPB.
3. Animal Cell Biotechnology (1998), R.E. Spier& J.B. Griffiths, Academic Press

#### **Course Outcome:**

After completion of course, student should be able to

- Proficient knowledge of tissue culture can benefit the students in areas of cloning, strain development as well as new plant and animal breed development.
- With good theoretical knowledge and hands on experience students will have better employment prospects and many industries.

# Chhattisgarh Swami Vivekananda Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Enzyme Technology**

**Total Marks in End Semester Exam: 100**

**Minimum number of Class Tests: 2**

**Branch: Biotechnology**

**Course Code: C018612(018)**

**L: 3 T: 1 P: 0 Credits: 4**

## **Course Objective(s):**

- To develop skills of students in the area of Enzyme engineering and technology.
- To make the students understand the application of enzymes in different areas of biotechnology as well as towards human welfare.
- An overview of the key enzymes currently used in large scale industrial processes.
- An introduction to downstream processing & purification methods, and enzyme optimization through enzyme discovery and engineering.
- This course serves to provide an awareness of the current and possible future applications of enzyme technologies.

## **UNIT-I Introduction to Enzyme**

- Classification of enzymes; Mechanisms of enzyme action; Concept of active site and energetics of enzyme substrate complex formation.
- Specificity of enzyme action; Principles of catalysis – collision theory, transition state theory.

## **UNIT-II Kinetics of Enzyme Reactions**

- Kinetics of single substrate reactions; Estimation of Michelis –Menten parameters, multi substrate reactions- mechanisms and kinetics.
- Allosteric regulation of enzymes, pH and temperature effect on enzymes & deactivation kinetics.

## **UNIT-III Enzyme Immobilization**

- Physical and chemical techniques for enzyme immobilization – adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding etc.
- Advantages and disadvantages.

## **UNIT-IV Purification and Characterization of Enzymes from Natural Sources**

- Production and purification of crude enzyme extracts from plant and microbial sources.
- Methods of characterization of enzymes.
- Development of enzymatic assays.

## **UNIT-V Enzyme Biosensors**

- Application of enzymes in analysis.
- Design of enzyme electrodes and their application as biosensors in industry, healthcare and environment.

**Text Books:**

1. “Biochemical Engineering”, Harvey W. Blanch, Douglas S. Clark, Marcel Dekker, Inc.
2. “Biochemical Engineering”, James M. Lee, PHI, USA.

**Reference Books:**

1. “Biochemical Engineering Fundamentals”, James. E. Bailey & David F. Ollis, McGraw-Hill.
2. “Enzyme Biotechnology”, Wiseman, Ellis Horwood Pub.

**Course Outcome:**

After completion of course, student should be able to

- Learn about enzymes, their mode of action, Kinetics of enzyme action and techniques like enzyme immobilization, purification of enzymes & Biosensors.
- Serve as a pre-requisite for courses in Bioprocess technology, downstream processing.

# Chhattisgarh Swami Vivekananda Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Food Processing Technology**

**Total Marks in End Semester Exam: 100**

**Minimum number of Class Tests: 2**

**Branch: Biotechnology**

**Course Code: C018613(018)**

**L: 3 T: 1 P: 0 Credits: 4**

## **Course Objective(s):**

- To provide an overview of the food processing industry.
- To introduce the students with issues such as food safety and nutrition, causes and control of food poisoning and spoilage, diet and health.
- To introduce food laws and regulations, as well as the manufacture of some of the common food.
- To learn about the principles of, and equipment for, processing of food with heat addition or removal.
- To understand how different processing conditions and methods can affect the safety and quality of resulting 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**

- 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 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.

#### **Text Books:**

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

#### **Reference Books:**

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

#### **Course Outcome:**

After completion of course, student should be able to

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

# Chhattisgarh Swami Vivekananda Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Machine Learning**

**Total Marks in End Semester Exam: 100**

**Minimum number of Class Tests: 2**

**Branch: Biotechnology**

**Course Code: C018631(018)**

**L: 2 T: 1 P: Credits: 3**

## **Course Objective(s):**

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques.
- To study the various probabilities based learning techniques.
- To understand graphical models of machine learning algorithms.
- To apply the apt machine learning strategy for any given problem.

## **UNIT-I Introduction**

- Learning, Types of Machine Learning, Supervised Learning, The Brain and the Neuron, Design a Learning System, Perspectives and Issues in Machine Learning.
- Concept Learning Task, Concept Learning as Search, Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm.
- Linear Discriminants, Perceptron, Linear Separability, Linear regression.

## **UNIT-II Linear Models**

- Multi-layer Perceptron, Going Forwards, Going Backwards,
- Back Propagation Error, Multi-layer Perceptron in Practice, Examples of using the MLP, Overview, Deriving Back-Propagation, Radial Basis Functions and Splines,
- Concepts, RBF Network, Curse of Dimensionality, Interpolations and Basis Functions, Support Vector Machines.

## **UNIT-III Tree and Probabilistic Models**

- Learning with Trees, Decision Trees, Constructing Decision Trees.
- Classification and Regression Trees, Ensemble Learning, Boosting, Bagging.
- Different ways to Combine Classifiers, Probability and Learning, Data into Probabilities, Basic Statistics.
- Gaussian Mixture Models, Nearest Neighbor Methods, Unsupervised Learning, Kmeans Algorithms, Vector Quantization, Self Organizing Feature Map.

## **UNIT-IV Dimensionality Reduction and Evolutionary Models**

- Dimensionality Reduction, Linear Discriminant Analysis, Principal Component Analysis, Factor Analysis.
- Independent Component Analysis, Locally Linear Embedding, Isomap, Least Squares Optimization.
- Evolutionary Learning, Genetic algorithms, Genetic Offspring: Genetic Operators, Using Genetic Algorithms.
- Reinforcement Learning, Overview, Getting Lost Example, Markov Decision Process.

## **UNIT-V Graphical Models**

- Markov Chain Monte Carlo Methods, Sampling, Proposal Distribution, Markov Chain Monte Carlo.
- Graphical Models, Bayesian Networks, Markov Random Fields, Hidden Markov Models, Tracking Methods.

### **Text Books:**

1. Stephen Marsland, — Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.

### **Reference Books:**

1. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
2. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014.

### **Course Outcome:**

After completion of course, student should be able to

- Distinguish between, supervised, unsupervised and semi-supervised learning.
- Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem.



# Chhattisgarh Swami Vivekananda Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Waste Management & Upcycling**

**Total Marks in End Semester Exam: 100**

**Minimum number of Class Tests: 2**

**Branch: Biotechnology**

**Course Code: C018632(018)**

**L: 2 T: P: Credits: 2**

## **Course Objective(s):**

- To introduce fundamental aspects of types of waste and its management.
- To disseminate knowledge on various waste management technologies.
- To provide knowledge on how waste can be converted to wealth in a sustainable way.
- To enable students to think innovative way to develop concepts in waste management.
- The students shall get an adequate knowledge on waste and its sustainable management.

## **UNIT-I Waste management**

- The definition of waste, and its classification in the context of EU legislation, policy and other drivers for change, including the planning and permit in regime for the delivery of waste management solutions.
- Liquid waste collection, treatment and disposal systems: Segregation and mixing schemes; Pre-treatment and its role in the industrial wastewater management.
- Overview of wastewater treatment technologies and development of wastewater treatment schemes; Operation and maintenance of effluent treatment plants; and Case study of an industrial wastewater management system.
- Air Pollution management and treatment: Overview of industrial emissions; Airpollution control systems and overview of air pollution control technologies.
- Development of schemes for the collection, treatment and discharge industrial emissions.

## **UNIT-II Technologies for Waste treatment technologies**

- Waste incineration and energy from waste, pyrolysis and gasification, anaerobic digestion.
- Composting and mechanical biological treatment of wastes, managing biomedical waste.

## **UNIT-III Waste Recycling and Recovery Technologies**

- Health considerations in the context of operation of facilities, handling of materials and impact of outputs on the environment.
- Advances in waste recycling and recovery technologies to deliver added value products; Landfill engineering and the management of landfill leachate and the mining of old landfills.

## **UNIT-IV Resource Management**

- Interface of waste and resource management and civil engineering in the context of sustainable waste management in global cities and developing countries.
- Use of decision support tools including multi-criteria analysis, carbon foot-printing and life cycle analysis, as appropriate.

### **UNIT-V Case Studies**

- Waster Up cycling, waste reuse, Waste down cycling, waste up cycling a social enterprise.
- Case study in each area. Innovative technologies for sustainable waste management.

### **Text Books:**

1. O.P. Gupta, “Elements of Solid & Hazardous Waste Management”, Khanna Publishing House, New Delhi, 2019.
2. George Tchobanoglous et.al., “Integrated Solid Waste Management”, McGraw-Hill Publishers, 1993.

### **Reference Books:**

1. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, “Waste Management”, Springer, 1994.

### **Course Outcome:**

After completion of course, student should be able to

- Develop concepts in managing waste of their institutions.
- Experiential learning with a waste management company in the vicinity.

# Chhattisgarh Swami Vivekananda Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Stem-Cell Technology**

**Total Marks in End Semester Exam: 100**

**Minimum number of Class Tests: 2**

**Branch: Biotechnology**

**Course Code: C018633(018)**

**L: 2 T: P: Credits: 2**

## **Course Objective(s):**

- To familiarize the students with stem cell technology and its applications for betterment of the society.
- To impart knowledge of wide-ranging topics related to stem cells and regenerative biology.
- A brief history of the field, research on animal models of regeneration.
- Tissue engineering, social and ethical issues related to stem cell research.
- The basic biology of these stem cells as well as bioengineering and application of these stem cells to potential treatments of human diseases.

## **UNIT-I Introduction to Stem Cell and stem cell Niche**

- Introduction to Stem Cells: Principles and properties of stem cells, types of stem cells, comparison of embryonic and adult stem cells.
- Stem Cell Niche: Introduction to stem cell niches in gut epithelium, bone marrow, epidermis, testis and neural tissues.

## **UNIT-II Cell Cycle and Development**

- Cell cycle regulators and checkpoints, cell fusion, differentiation of stem cells and their role in self-renewal.
- Epigenetic Control: DNA-methylation and histone modifications, genomic imprinting, telomerase regulation.
- X-chromosome inactivation, reprogramming of cells, induced pluripotent stem cells and their therapeutic applications.

## **UNIT-III Types and Regeneration**

- Stem cells derived from amniotic fluid, extra embryonic membrane, germ cells, hematopoietic organs, neurons and kidney.
- Cord blood transplantation, donor selection, HLA matching, patient selection, peripheral blood and bone marrow transplantation.
- Bone marrow and cord blood collection procedures and cryopreservation and their applications.

## **UNIT-IV Experimental Methods**

- Isolation and differentiation of human adult stem cells, embryonic stem cells and mouse stem cells
- Stem cell techniques: fluorescence activated cell sorting (FACS), time lapse video, green fluorescent protein tagging.

### **UNIT-V Application**

- Stem cells applications in cancer, diabetes, heart disease, muscular dystrophy, regeneration of epidermis.
- Stem cell regulations, debate, social and ethical concerns, Organ farming.

#### **Text Books:**

1. Hematopoietic Stem Cell Transplantation by Treleaven, J., first edition 2009.
2. Essentials of Stem Cell Biology by Lanza, R., second Edition, 2009 Academic Press.

#### **Reference Books:**

1. Molecular Cell Biology by Lodish et al., sixth Ed., W.H. Freeman & Co. 2008.
2. Stem Cells: From Bench to Bedside by Bongso and Ariff.

#### **Course Outcome:**

After completion of course, student should be able to

- Learn isolation, characterization, and applications of stem cells in Biotechnology.
- Learn about different types of stem cells and how they are derived and the extent of their plasticity.

# Chhattisgarh Swami Vivekanand Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 5<sup>th</sup>**

**Subject: Plant and Animal Biotechnology (Lab)**

**Total Marks in End Semester Exam: 40**

**Branch: Biotechnology**

**Course Code: C018621(018)**

**L: 0 T: 0 P: 2 Credits: 1**

## **List of Experiments:**

1. Preparation of reagents and media for cell culture.
2. Preparation and sterilization of standard tissue culture media.
3. Sterilization of explants and generation of undifferentiated mass of cells. Regeneration of plants from undifferentiated cells.
4. Cell counting and plating.
5. Animal Cell Culture Biosafety and Ethical Concerns.
6. Determination of common cell culture contaminants.
7. Analysis of crude extracts from medicinal plants using HPLC.
8. Cryopreservation of cell lines
9. Determination of common cell culture contaminants
10. Cell Viability Assay (MTT reagent)

## **Equipments/Machines/Instruments/Tools/Software Required:**

- Microscope
- Balance (500 g – 0.1 g)
- Balance (200g - 0.1 mg)
- Table top Centrifuge
- Laminar air Flow
- Autoclave
- Column
- Microfuge
- Micropipettes (200  $\mu$ l – 1000  $\mu$ l), (20  $\mu$ l - 200  $\mu$ l), (1  $\mu$ l – 20  $\mu$ l).
- Hot air Oven
- Vortex shaker

- Magnetic Stirrer
- Fume hood
- Bunsen Burner
- Soxhlet Apparatus
- Deep freezer

**Recommended Books:**

1. Basic Cell Culture Second Edition, Oxford University Press by Davis, J.M.
2. Principles of Plant Genetics and Breeding by George Acquaah 2007. BlackwellPublishing.

# Chhattisgarh Swami Vivekanand Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Enzyme Technology (Lab)**

**Total Marks in End Semester Exam: 40**

**Branch: Biotechnology**

**Course Code: C018622(018)**

**L: 0 T: 0 P: 2 Credits: 1**

## **List of Experiments:**

1. Production of Amylase by *Aspergillusniger*.
2. Effect of temperature/pH/concentration on salivary amylase activity.
3. Production of catalase enzyme by microorganisms.
4. Production of lactase by yeast cell.
5. Various Techniques of enzyme immobilization.
6. Study of various enzyme reactors.
7. Preparation of poly/bifunctional enzymes.
8. Test for urease activity.
9. Test for oxidase activity.
10. Determination of Ammonium Sulphate precipitation in given sample.

## **Equipments/Machines/Instruments/Tools/Software Required:**

1. Laminar Air Flow
2. Separating funnel
3. Stirrer
4. Burette
5. Pipette
6. Round bottom flask
7. Condenser
8. Air Oven

## **Recommended Books:**

1. Experiments in Microbiology, Plant Pathology and Biotechnoogy by K R Aneja
2. An introduction to practical biotechnology Isted, (2006), S.Harisha, Laxmi Publications (P) Ltd.

# **Chhattisgarh Swami Vivekanand Technical University, Newai**

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Food Processing Technology (Lab)**

**Total Marks in End Semester Exam: 40**

**Branch: Biotechnology**

**Course Code: C018623(018)**

**L: 0 T: 0 P: 2 Credits: 1**

## **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.

## **Equipments/Machines/Instruments/Tools/Software Required:**

- Microscope
- Balance (200g - 0.1 mg)
- Table top Centrifuge
- Micropipettes (200  $\mu$ l – 1000  $\mu$ l), (20  $\mu$ l - 200  $\mu$ l), (1  $\mu$ l – 20  $\mu$ l).
- Hot air Oven
- UV -Vis spectrometer
- Vortex shaker
- Deep freezer
- Moisture Analyzer
- Colorimeter
- Spray Dryer
- Shaking Incubator



**Recommended Books:**

1. An introduction to practical biotechnology Isted (2006), S.Harisha, Laxmi Publications (P) Ltd.
2. Technology of food preservation, Desrosier, CBS Publication.

# **Chhattisgarh Swami Vivekanand Technical University, Newai**

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Machine Learning (Lab)**

**Total Marks in End Semester Exam: 40**

**Branch: Biotechnology**

**Course Code: C018624(018)**

**L: 0 T: 0 P: 2 Credits: 1**

## **List of Experiments:**

1. Prediction, Errors, and Cross Validation.
2. The Caret Package.
3. Predicting with trees, Random Forests, & Model Based Predictions.
4. Regularized Regression and Combining Predictors.

## **Equipments/Machines/Instruments/Tools/Software Required:**

- **Computer**

## **Recommended Books:**

1. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series) ||, Third Edition, MIT Press, 2014.
2. Rajiv Chopra, - Machine Learning ||, Khanna Book Publishing Co. 2019.

# **Chhattisgarh Swami Vivekanand Technical University, Newai**

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Waste Management & Upcycling (Lab)**

**Total Marks in End Semester Exam: 40**

**Branch: Biotechnology**

**Course Code: C018625(018)**

**L: 0 T: 0 P: 2 Credits: 1**

## **List of Experiments:**

1. Estimate the moisture content and specific weight of solid waste sample.
2. Determine the approximate chemical composition of a solid waste sample and estimate the energy content.
3. Assess the solid waste quantities using material-balance analysis.
4. Statistical analysis of solid waste collected data.
5. Selection of container size for use at a commercial facility.
6. Analysis of waste collection systems.

## **Equipments/Machines/Instruments/Tools/Software Required:**

- Microscope
- Balance (200g - 0.1 mg)
- Table top Centrifuge
- Micropipettes (200  $\mu$ l – 1000  $\mu$ l), (20  $\mu$ l - 200  $\mu$ l), (1  $\mu$ l – 20  $\mu$ l).
- Hot air Oven
- UV -Vis spectrometer
- Vortex shaker
- Deep freezer
- Moisture Analyzer
- Colorimeter
- Spray Dryer
- Shaking Incubator

## **Recommended Books:**

- a. Tchobanoglous G., Theisen H., and Vigil S.A. (2014). Integrated Solid Waste Management, Engineering Principles and Management Issues, 2nd Ed., McGraw-Hill, USA.
- b. Peavy, H.S, Rowe, D.R., and Tchobanoglous, G., (2017). Environmental Engineering, Indian ED, McGraw Hill Inc., India.

# Chhattisgarh Swami Vivekanand Technical University, Newai

**Name of the Program: Bachelor of Technology**

**Semester: B.Tech – 6<sup>th</sup>**

**Subject: Stem Cell Technology (Lab)**

**Total Marks in End Semester Exam: 40**

**Branch: Biotechnology**

**Course Code: C018626(018)**

**L: 0 T: 0 P: 2 Credits: 1**

## **List of Experiments:**

1. Colony formation assays
2. Culture of adult stem cells
3. Real Time PCR for stem cell markers
4. Western blot for stem cell markers
5. Adult stem cell differentiation and visualization by staining (Example: Adipocytes)

## **Equipments/Machines/Instruments/Tools/Software Required:**

- Microscope
- Balance (200g - 0.1 mg)
- Table top Centrifuge
- Micropipettes (200  $\mu$ l – 1000  $\mu$ l), (20  $\mu$ l - 200  $\mu$ l), (1  $\mu$ l – 20  $\mu$ l).
- Hot air Oven
- UV -Vis spectrometer
- Vortex shaker
- Deep freezer
- Moisture Analyzer
- Colorimeter
- Spray Dryer
- Shaking Incubator

## **Recommended Books:**

1. Molecular Cell Biology by Lodish et al., sixth Ed., W.H. Freeman & Co. 2008
2. Stem Cells: From Bench to Bedside by Bongso and Ariff.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Program / Semester: <b>B.Tech (VI)</b>	Branch: <b>Humanities</b>
Subject: <b>Technical Communication &amp; Soft Skills</b>	Course Code: <b>C000601(046)</b>
Total Marks (Internal Assessment): 10	L: 0 T:0 P: 2 Credit(s): 0
Internal Assessments to be conducted: 02	Duration (End Semester Exam): <b>NA</b>

**UNIT-1 Communication Skills-Basics:** Understanding the communicative environment, Verbal Communication; Non Verbal Communication & Cross Cultural Communication, Body Language & Listening Skills; Employment Communication & writing CVs, Cover Letters for correspondence. Common errors during communication, Humour in Communication.

**UNIT-2 Interpersonal communication:** Presentation, Interaction and Feedbacks, Stage Manners, Group Discussions (GDs) and facing Personal Interviews, Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities.

**UNIT- 3 Vocational skills:** Managing time: Planning and Goalsetting, managing stress: Types of Stress; Making best out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace.

**UNIT-4 Mindsets and Handling People:** Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to Lead a Meeting, How to Speak Effectively in Meetings, Behavior & Roles in Meetings, Role Play: Meeting. On Saying “Please”, How to say “NO”.

**UNIT-5 Positive Psychology:** Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others, controlling anger, Gaining Power from Positive Thinking.

## Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

## Reference Books:

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman & Molly Hamaker. The Hard Truth about Soft Skills. London: Harper Collins E-books, 2007.

## Course Outcomes

1. Learn to listen actively to analyse audience and tailor the delivery accordingly.
2. Increase their awareness of communication behaviour by using propriety-profiling tool.
3. Master three “As” of stressful situation: Avoid, Alter, Accept; to cope with stressors and create a plan to reduce or eliminate them.
4. Develop growth mind-set and able to handle difficult person and situations successfully.
5. Develop technique of turning negativity into positivity and generate self-motivation skills.