ST.JOSEPH'S COLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

I SEMESTER **BIOTECHNOLOGY** Time: 4Hrs/wk

BTH 1701 (3) **CELL BIOLOGY AND GENETICS** Marks: 100

W.e.f 2019-20 admitted batch ('19 AG' batch)

OBJECTIVES: To enable the students to –

- Understand the scope of Biotechnology
- Know the principles of microscopy
- Understand the ultra structure of cells & cell division

Course outcomes: Students will

- **CO1:**.be acquainted with various types of microscopies and realizes their importance in identification of microbial forms.
- **CO2:** be familiar with the ultra-structure of microbial forms and complexity of cell wall structure.
- **CO3:** differentiate between prokaryote & eukaryote.
- **CO4:** Be acquaintance with classical genetics and evaluate the any deviated ratios of genetics. Identify the deviations from classical genetic ratios
- **CO5:** Acquired the basic concepts on genetic recombination and sex determination.

COURSE:

UNIT I: INTRODUCTION

1. Scope & applications of Biotechnology
2. Microscopy :
   i. Compound microscopy – Numerical aperture &its importance, resolving power, oil – immersion objectives& their significance.
   ii. Principles & Applications of Dark – field, phase – contrast, fluorescent microscopy.
   iii. Electron microscopy – Principle, Ray diagram & applications of TEM & SEM, comparison between optical and electron microscope.

UNIT II: PROKARYOTIC CELL

1. Bacterial morphology – General morphology of bacteria: shapes and sizes. Generalized diagram of typical bacterial cell.
2. Slime layer & Capsule, Flagella, Pili & Fimbriae.
3. Cell wall – Gram positive & Gram negative
4. Bacterial chromosomal organization, plasmids – types of plasmids.
5. Endospores – Structure, formation germination, basis of resistance.

UNIT III: EUKARYOTIC CELL & CELL DIVISION

1. Structure and functions of nucleus, nuclear membrane, nucleoplasm, nucleolus, golgi complex, mitochondria, chloroplast, endoplasmic reticulum, lysosomes, peroxisomes, glyoxysomes and vacuoles.
2. Plant cell wall
3. Concept of cell cycle, cell division – mitosis & meiosis.

UNIT IV: MENDEL'S LAWS & INHERITANCE

1. Mendel's experiments – Factors contributing to success of Mendel's experiments.
2. Mendel's laws – Law of segregation, Law of Dominance, Law of Independent Assortment.
3. Deviations from Mendel's laws – Incomplete and Co-dominance.
4. Penetration and Pleiotropism.
5. Recessive & Dominant Epistatic gene interactions (9:3:4, 12:3:1, 13:3).
6. Concept of Multiple alleles.

UNIT V: GENETIC INHERITANCE

1. Linkage, Recombination frequency factors, Gene maps, Interference & Co-incidence.
2. Mitotic Crossing over
3. Sex determination in *Drosophila.*
4. Transposable elements - Types, Structure, Mechanism and examples – AC-DS elements in *Maize.*

REFERENCES:

1. Cell and Molecular Biology by Robertis&Robertis, Waverly publications,8th Edition, (2001).
2. Cell biology and Genetics – By P.K. Gupta – Rastogi Publication, 2016.
3. Genetics – B.D. Singh, – Kalyani Publication, 2003.
4. Concept of Genetics - Klug and Cummings, – Pearson Education, New Delhi, 2003.
5. Genetics – Monroe, W. Strickberger, Pearson Education India, 2015

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

I SEMESTER **BIOTECHNOLOGY** Time: 3Hrs/Wk

BTH 1751 (2) **PRACTICAL – I A** Marks: 50

w.e.f. 2019-20 admitted batch (19 AG' batch)

CELL BIOLOGY & GENETICS

Objective: Students are enabled to

- observe different microscopy
- prepare different phases of mitosis and meiosis
- be proficient in solving the problems in genetics.

Course outcomes: Students will

- **CO1:** be competent with different microscopy.
- **CO2:** be capable in chromosome slide preparation and counting.
- **CO3:** proficient in analyzing the heredity data with karyotyping.

Course:

I. Microscopy - Different parts and their function

II. Methods in Cytology:

A. Cytological Preparation

Fixation, Dehydration and Staining

B. Squash Preparation -Mitosis (Onion Root Tip)

-Meiosis (Onion / Maize flower buds)

- Karyotype (Onion Root Tip)

III. Genetics

A. Solving problems in

- Monohybrid ratio
- Dihybrid ratio
- Incomplete Dominance
- Linkage and Crossing Over

REFERENCES:

1. Singh, Ram J., Practical Manual on Plant Cytogenetics, Boca Raton: CRC Press, 2018, Taylor & Francis group, London, New York.
2. **https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/biology/lelm205.pdf**
3. David A. Thompson. 2011. Cell and Molecular Biology Lab. Manual
4. Mary L. Ledbetter. 1993. Cell Biology: Laboratory Manual. Edition: 2. Published by Ron Jon Publishing. Incorporated.

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ST.JOSEPH'S COLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

II SEMESTER **BIOTECHNOLOGY** Time: 4Hrs/wk

BTH 2701 (3) **TECHNIQUES IN BIOTECHNOLOGY** Marks: 100

w.e.f 2019-20 admitted batch ('19 AG' batch)

OBJECTIVES: To enable the students to –

- Develop familiarity with important biochemical & biophysical techniques employed in characterization of various molecules.

COURSE OUTCOMES: Students will

- **CO1:** Be granted to separate the compounds with the available methods in centrifugation.
- **CO2:** Be differentiate the properties of a light radiation with reference to Beer's law and Lambert's law.
- **CO3:** Proficient to characterize the molecules with regard to their size, shape and interaction with other molecules.
- **CO4:** Able to confer the quantitative/qualitative evaluation of the molecules in accord to their charge/mass ratio.
- **CO5:** Acquire the proficiency on radio labeled compounds.

COURSE:

UNIT I: CENTRIFUGATION

1. Basic principles, concept of RCF, Ultra centrifuge – types
2. Preparative centrifugation: Differential and density gradient centrifugation, Applications (Isolation of cell components).
3. Analytical centrifugation: Light absorption system, Alternative schlieren system, Ray-leigh interference system.
4. Dialysis and Lyophilization.

UNIT II: SPECTROPHOTOMETRY

1. Concept of electromagnetic radiations, spectrum of light, absorption of electromagnetic radiation, absorption spectrum and its uses, Beer – Lambert's law.
2. Colorimeter: Instrumentation of U.V & visible spectrophotometry, double beam spectrophotometer.
3. Applications of U.V & visible spectrophotometry

UNIT III: CHROMATOGRAPHY

Chromatography: Principle, methodology and applications of

1. Paper Chromatography
2. Thin – layer Chromatography
3. Gel – filtration Chromatography
4. Ion – Exchange Chromatography
5. Affinity Chromatography

UNIT IV: ELECTROPHORESIS

1. Migration of ions in electric field, factors affecting electrophoretic mobility.
2. Paper electrophoresis: electrophoresis run, detection techniques, cellulose acetate electrophoresis
3. Gel electrophoresis: Types of gels, procedure, column and slab gels, detection, recovery and estimation of macromolecules.
4. SDS PAGE: Applications, determination of molecular weight of proteins, molecular biology applications.
5. Iso-electric focusing: Principle, establishing P^H, procedure and applications.

UNIT V: ISOTOPIC TRACER TECHNIQUES

1. Radioactive and stable isotopes, rate of radioactive decay, units of radioactivity.
2. Measurement of radioactivity: Ionization chamber, propositional counter, Geiger – Muller counter, Solid and Liquid scintillation counter (basic principle, instrumentation and technique)
3. Applications of Isotopes in Biotechnology (Distribution studies, Metabolic studies, Isotopic dilution techniques, Clinical applications in Autoradiography)

REFERENCES:

1. An introduction to practical Biochemistry by Plummer – DT, Tata McGraw Hill Co, New Delhi, (1988).
2. Biologist Guide to Principles & Techniques of Practical Biochemistry by Wilson, K & Goulding K.M. A ELBS Publication, New Delhi, (1986).
3. Biochemistry, Stryer L – Freeman Toppan Delhi, (2000).
4. Principles of Biochemistry, Lehninger, Al, Wortlo – Delhi, (2000).
5. Biophysical and Chemical Techniques, Upadhyay, Upadhyay, Himalayas Publications, New Delhi, (2002)

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

II SEMESTER **TECHNIQUES IN BIOTECHNOLOGY** Time: 3 Hrs/Wk

BTH 2751(2) **PRACTICAL SYLLABUS – I B** Marks: 50

w.e.f: 2017-2020 ("17 AE")

OBJECTIVES : To acquire the knowledge in techniques & instrumental handling in biotechnology.

COURSE OUT COMES: Students will

- **CO1:** Attain knowledge in quantitative estimation of biomolecules.
- **CO2:** Be proficient in separation of molecules with regard to their physico-chemical criterion.
- **CO3:** Be skillful in osmosis, for concentrated molecules.

COURSE:

1. Colorimeter – verification of Beer – Lambert's law
2. Thin layer Chromatography separation of Amino acids
3. Paper Chromatography separation of Amino Acids.
4. Dialysis Demonstration.
5. Agarose Gel Electrophoresis
6. SDS-PAGE

REFERENCES:

1. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu. Pvt.Ltd. New Delhi, India.

2. Biochemical Methods,1st Edition, (1995), S.Sadashivam, A.Manickam; New Age International Publishers, India.

3. Experimental Biochemistry: A Student Companion, 1st Edition, (2005), Beedu Sashidhar Rao & Vijay Deshpande; I.K. International Publishing House Pvt. Ltd, India.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

III SEMESTER **BIOTECHNOLGY** **Time:4 Hrs/Week**

BTH 3701 (3) **MOLECULAR BIOLOGY** **Max. Marks: 100**

w.e.f 2019-20 admitted batch (19AG) SYLLABUS

OBJECTIVES: To enable the students

- To understand the organization and function of DNA and RNA at molecular level.
- To comprehend the concepts of gene expression and regulation of gene expression.
- To understand the molecular basis of mutations.

COURSE OUTCOMES: Students will

CO1: Be proficient at structure and functions of nucleic acids with regard to double helical model of DNA.

CO2: Acquainted with the ultrastructure of nucleus and its organization.

CO3: Be expertise in DNA replication & repair, transcription, translation and gene expression (Operon concepts) of both prokaryotes and eukaryotes.

CO4: Acquire a knowledge on various mutations and selection with reference to genetic variation.

COURSE:

UNIT I: GENE & GENOME ORGANISATIONS

1. Identification of DNA and RNA as genetic material, Structure of DNA by Watson & Crick model
2. Organization of nuclear genome – genes and gene numbers; Satellite DNA
3. Gene Families and clusters (Eg: Globin genes, histones).
4. DNA Replication – Models of DNA Replication semi-conservative, proof of semi-conservative replication.
5. Enzymology of Replication (DNA Polymerase – I, II, & III, Helicases, Topoisomerases, Single strand binding proteins, DNA melting proteins, Primases).

UNIT II: REPLICATION OF DNA

1. Mechanism of DNA replication in Eukaryotes – linear method.
2. Mechanism of DNA replication in prokaryotes
   a. Rolling circle method b. Theta mechanism
3. Gene mutation: Mutagenesis – Spontaneous and induced (Chemical & Physical) mutations, Natural and induction of mutations, point mutation, Frame-shift mutation, Auxotrophic conditional and suppressor mutations.
4. DNA damage & Repair: Light induced repair, Excision repair and Mis-match repair, Post replication repair, Rec-gene & its role in DNA repair, SOS repair and SOS response.

UNIT III: TRANSCRIPTION

1. Prokaryotic Transcription – Structure of prokaryotic RNA Polmerase (Core enzyme & Holo enzyme, sigma factor), Exons, Introns, Promoter (Pribnow box, - 10 & - 35 sequence), and terminators, Transcription process.
2. Eukaryotic transcription
3. Post – transcriptional modifications (capping, polyadenylaiton, splicing & alternate splicing)
4. Poly and mono cistronic mRNA
5. Reverse Transcription

UNIT IV: TRANSLATION

1. Genetic Code and its feature & Wobble Hypothesis. Structure of mRNA & tRNA.
2. Translation – Synthesis of polypeptides – Initiation, elongation and termination in prokaryotes.
3. Translation – Synthesis of polypeptides – initiation, elongation and termination in eukaryotes.

UNIT V: REGULATION OF GENE EXPRESSION & EXTRA CHROMOSOMAL ELEMENTS

1. Regulation of gene expression in Prokaryotes; operon concept – Negative and Positive control of Lac – Operon, Trp – Operon, Control of gene expression.
2. Regulation of gene expression in Eukaryotes
3. Chloroplast genome organization in plants.
4. Mitochondrial genome organization (Eg: Humans)

REFERENCES

1. Cell and Molecular Biology by Robertis & Robertis, Waverly publications, 8th Edition, (2001).
2. Molecular Biology of the Gene – By Watson, Hopkins, Goberts , Steitz & Weiner Public. Pearson Education (2002).
3. Principles of Gene Manipulation – By R.W. Old ANA S.B.Primson Public. Warosa 6th Edition (2003)
4. Molecular Biology & Biotechnology – By H.D. Kumar Public. Vikas (2005).
5. Cell Biology & Genetics by Varma & Agarwal S.Chand Publications, (2008-2009).
6. Genome 3 – T.A Brown, Garland Science publications, 3rd edition, (2006).

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER **BIOTECHNOLGY** TIME: 3 Hrs/Week

BTH 3751 (2) **PRACTICALS** Max. Marks:50

w.e.f. 2019-20 **MOLECULAR BIOLOGY - II B**

admitted batch (19AG)

OBJECTIVES: To enable the students to –

I. Get hands on experience on isolation and estimation of nucleic acids.

COURSE OUTCOMES: Students will

CO1: get hands on experience with isolation of different nucleic acid sources.
CO2: Be expert in quantification of nucleic acids
CO3: Familiar with Polymerase Chain Reaction (PCR).

COURSE:

I: Isolation of RNA from yeast.

II Isolation of DNA from coconut endosperm

III. Estimation of phosphorus.

IV: Isolation of chromosomal & plasmid DNA from bacteria.

V: Estimation of RNA by orcinol method.

VI: Estimation of DNA by Diphenyl amine method.

REFERENCES:

1. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu. Pvt.Ltd. New Delhi, India.

2. Biochemical Methods,1st Edition, (1995), S.Sadashivam, A.Manickam; New Age International Publishers, India.

3. David A. Thompson. 2011. Cell and Molecular Biology Lab. Manual

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

IV SEMESTER BIOTECHNOLGY Time: 4Hrs/Week

BTH 4701 (3) MICROBIOLOGY Max.Marks: 100

w.e.f. 2016-2019("16AD") SYLLABUS

OBJECTIVES: To enable the students to

1. Comprehend the diversity of microorganisms.
2. Know the technique of culturing and studying Microorganisms.
3. Understand the applications of microbiology.
4. Understand the organization, replication and economic importance of viruses.

COURSE OUTCOMES: Students will

- **CO1:** Be consciousness in microbial world & expertise in Ultra structure and physiology.
- **CO2:** Be skillful in bio-safety guidelines.
- **CO3:** Be approved in characterization of microbial forms with the available methods.
- **CO4:** Endowed in evaluating the microbial growth kinetics..
- **CO5:** bolster about viruses and bacteriophages.

COURSE:

UNIT - I: DIVERSITY OF MICRO ORGANISMS

1. Introduction & History and development of Microbiology
2. Microbial Nutrition & Nutritional classification of bacteria
3. Gene recombination in Bacteria.
4. Ultrastructure of archaea, archaeal cell membrane, other cell structures.
5. Classification of Bacteria – Bergey's manual.

UNIT - II: METHODS IN MICROBIOLOGY – I

Sterilization methods – Terminology of Sterilization, disinfection, antiseptic, sanitization, germicide, microbiostasis, preservative and antimicrobial agents.

i. Physical control: Temperature (moist heat- autoclave, dry heat- hotair oven & incinerators),dessication, surface tension, osmotic pressure, radiation, UV light, filtration-LAF

ii. Chemical control: Antiseptics and disinfectants (halogens, alcohol, gaseous sterilization).

UNIT - III: METHODS IN MICROBIOLOGY – II

1. Culturing of Micro-organisms
   - Culture media – Composition & Types
   - Culturing Methods
   - Isolation of pure culture
2. Staining Methods
   - Simple Staining
   - Differential staining by (1) Gram Staining, (2) Acid fast Staining,
     (3) Endospore Staining.
   - Hanging Drop Method

UNIT - IV: MICROBIAL GROWTH & MEASUREMENT

1. Microbial Growth
   a. Growth rate & generation time, details of growth curve and its various phases.
   b. Concept of synchronous cultures, continuous and batch cultures (chemostat and turbidostat).
   c. Measurement of Growth
2. Pure cultures and culture characteristics. Maintenance and preservation of pure cultures.

UNIT - V: VIROLOGY

1. General characteristics of viruses, Structure, different shapes and symmetries with one example of each type.
2. Classification of viruses on the basis of nucleic acids, phages and animal cell viruses, examples of each and their importance.
3. Replication of Viruses
4. Bacteriophage viruses - Lytic & lysogenic cycles.
5. Structure- TMV, HIV, Hepatitis

REFERENCES:

1. A Text book of Microbiology – By R.C.Dubey, D.K.Maheshwari public. S.Chand 2005
2. Text of Microbiology – By Ananthanarayan and panikes
3. General Microbiology – By R.P.Singh Publi. Kalyan Publication 2005.
4. Microbiology – By cappuceino
5. Practical Microbiology – by Arya
6. Elements of Microbiology Vy Pelezar and Chan public. MCGREW-Hill International, New Delhi.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) , VISAKHAPATNAM

IV SEMESTER **BIOTECHNOLGY** **Time:3Hrs/Week**

BTH 4751(2) **MICROBIOLOGY** **Max.Marks: 50**

W.e.f. 2016-2019("16AD") **PRACTICAL SYLLABUS – II B**

OBJECTIVES: To enable the students acquire skills necessary to –

1. handle equipment needed for study of microorganisms
2. culture microbial study.
3. identify the staining techniques.

COURSE OUTCOMES: Students will

1. Get hands on experience on bio-safety instruments
2. Be proactive at characterization of microbes.
3. Be strengthened in assessing the various food & water samples.

COURSE:

UNIT – I: Microbiological Examination of Organisms

1. Bacteria – E.coli, Streptococcus
2. Algae – Chalmydomonus
3. Fungi – yeast, Penicillium, Aspergillus

UNIT – II: Sterilization – Equipment for sterilization-Hot Air Oven, Autoclave, Laminar air flow chamber.

UNIT – III: Preparation of Culture media :

1. Nutrient Broth
2. Nutrient Agar
3. Maccanokey Agar
4. Potato Dextrose Agar

UNIT – IV: Microbial Culture – Methods

1. Innoculation Methods :

a. Streak method - i. Streaking on Plates
ii. Streaking on Slants

b. Serial Dilution

c. Pour Plate Method

d. Stab Method

UNIT – V: Staining Methods :

1. Simple Staining
2. Differential Straining
   i. Gram Staining
   ii. Acid fast staining

UNIT – VI: Microbiological Examination of Water

UNIT – VII: Microbiological Examination of Milk

UNIT – VIII: Bacterial Growth Curve.

REFERENCES:

1. P.Gunasekaran. 2007. Laboratory Manual in Microbiology. New Age International

2. Gunasekaran, P. 2009. Laboratory Manual in Microbiology. 1st Edition. New Age International Publishers.

3. James G. Cappuccino and Natalie Sherman. 2013. Microbiology: A Laboratory Manual. 10th Edition. Benjamin Cummings.

4. R. N. Bhattacharjee, 2016, Microbiology and Cell biology, Kalyani Publishers, New Delhi.

5. R. N. Bhattacharjee, 2017, Introduction to microbiology and Microbial diversity, Kalyani Publishers, New Delhi.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

V SEMESTER **BIOTECHNOLOGY** **TIME: 3 Hrs/Week**

BTH 5701 (3) **GENETIC ENGINEERING** **Max. Marks: 100**

w.e.f 2019-20 admitted batch (19AG) SYLLABUS

OBJECTIVES: To enable the students to –

- Learn enzymes used in recombinant DNA technology
- Understand the usage of cloning vectors
- Know various gene transfer techniques in r-DNA technology.
- Understand the concepts of blotting techniques, DNA fingerprinting, DNA sequencing methods.

COURSE OUTCOMES: Students will

CO1: Accustomed with the tools and techniques of genetic engineering molecular cloning and expression vectors.
CO2: conversant with ligation, restriction and digestion of various genetic materials.
CO3: Be knowledgeable in manipulating the genetic material at productive modes.
CO4: Validate the genetic material's authenticity in various fields with the available techniques.
CO5: Proficient in variety of bioinformatic tools to analyze the available data.

COURSE:

UNIT – I: RECOMBINANT DNA TECHNOLOGY – 1

1. r-DNA technology – Isolation and cutting of DNA molecule
2. Steps in r-DNA technology.
3. Classification of Restriction endonucleases. Enzymes used in molecular cloning: Polymerases, ligases, phosphatases, methylases, Kinases and nucleases.

UNIT – II: RECOMBINANT DNA TECHNOLOGY – 2

1. Cloning vehicles – plasmids, PBR-322, phages, cosmids, shuttle vectors
2. Genomic libraries – Genomic and c-DNA libraries
3. Expression of cloned genes
4. Factors influencing the expression of foreign genes.

UNIT – III: GENE TRANSFER TECHNIQUES

1. Cutting and joining DNA - Methods of blunt end ligation and Cohesive end ligation (Linkers, adaptors and homo polymer tailing)
2. Transfection – Electrophoration, Microinjection, Gene gun method, Liposome mediated Transfection, Calcium chloride precipitation.
3. Transformation. selection of transformed cells and screening methods (genetic markers and blue white screening)

UNIT – IV: TECHNIQUES IN GENETIC ENGINEERING

1. Blotting techniques – Southern, Northern & Western blotting
2. Polymerase chain Reaction (PCR)
3. Restriction fragment length polymorphisms (RFLP's)
4. Random amplification polymorphic DNA's (RAPD's)
5. DNA sequencing
6. DNA fingerprinting

UNIT-V: BIOINFORMATICS

1. Introduction of Bioinformatics.
2. Sequence information sources- EMBL, GENBANK, Entrez, Unigene.
3. Protein information sources – PDB, SWISSPROT, TREMBL.
4. Sequence similarity searches – BLAST, FASTA.

REFERENCES:

1. Principles of gene manipulations-by R.W.Old and S.B.Primrose, Blackwell publications, 6th edition, 2001.

2. Genetic Engineering by Michael Boylan and Kevin E.Brown, Pearson education, 1899.

3. Genetic Engineering and Biotechnology by V.Kumar Gera, Dhruv Publications, 2006.

4. Genetic Engineering by R.Williamson, public:Academic press, 1982.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

V SEMESTER **BIOTECHNOLOGY** TIME: 3 Hrs/Week

BTH 5702 (3) **PLANT AND ANIMAL BIOTECHNOLOGY** Max. Marks: 100

w.e.f 2015-2018("AC " batch) **SYLLABUS**

OBJECTIVES: To enable the students to –

- acquire knowledge about Plant tissue culture its uses and techniques involved in tissue culture
- Learn animal biotechnology which includes artificial insemination, *in vitro* fertilization and embryo transfer.

Course outcomes: Students will

- **CO1:** Capable to identify the economized protocols for both the classical & hybrid varieties, with the available tissue culture concepts.
- **CO2:** Acquaint in generating the virus free stocks, flexible to current agriculture practice.
- **CO3:** Be abundant in producing transgenic plants
- **CO4:** Able to evaluate animal culture media constituents and their role to manufacture the desired products
- **CO5:** Familiarize with *In-vitro* fertilization with regard to transgenic animals production.

PLANT BIOTECHNOLOGY

COURSE

UNIT I: PLANT TISSUE CULTURE

a. Composition of media (MS and Gamborg's only). Preparation of media and methods of sterilization.
b. Role of plant growth regulators in differentiation.
c. Initiation and maintenance of callus and suspension cultures; Single cell clones

UNIT II: APPLICATIONS OF TISSUE CULTURE

a. Meristem culture and production of virus free plants. Somatic embryogenesis and organogenesis.
b. Micropropagation, regeneration, production of haploids, protoplast culture and Somatic hybridization.
c. Mass cultivation of cell cultures and process engineering – batch and continuous culture Bioreactor.
d. Production of commercially useful compounds by plant cell culture.

UNIT III: GENE TRANSFER IN PLANTS

a. Gene transfer through Agrobacterium, Ti plasmid.
b. Applications of r-DNA technology in agriculture (Bt-cotton, Golden Rice)
c. Production of therapeutic proteins from transgenic plants

ANIMAL BIOTECHNOLOGY

UNIT IV: ANIMAL CELL CULTURE

a. Introduction to Animal Biotechnology.
b. Principles of animal cell culture – culture vessel.
c. Cell culture media preparation, sterilization, types of cultures.
d. Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell – cell communication etc., Cell senescence; Cell and tissue response to trophic factors. Immortal cells, Cell lines.
e. Maintenance and Preservation of cell lines.

UNIT V : APPLICATIONS OF ANIMAL BIOTECHNOLOGY

a. Invitro fertilization and embryo transfer technology.
b. Production of transgenic animals and molecular pharming (mice, sheep).

REFERENCES

1. Plant tissue culture-Basic and Applied-by Timir Baran Jhan and B.Ghosh
2. Essential of biotechnology for students by Satya N.Das
3. Plant tissue culture by Kalyan Kumar De -
4. Animal cells as bioreactor – by Terence Gartoright, Cambridge University press
5. Introduction to verterinary genetics by F.W.Nicholas, Oxford university press.

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

V SEMESTER **BIOTECHNOLGY** **Time: 2 Hrs/Week**

BTH 5751 (2) **GENETIC ENGINEERING** **Max. Marks: 50**

W.e.f. 2015-18 (15AC) **PRACTICAL SYLLABUS –III A**

OBJCECTIVE: To enable the students to learn the techniques of Genetic engineering

COURSE OUTCOMES: Students will

CO1: Accomplish the compatible molecules with the available genetic engineering tools.
CO2: Be able to convergence of two different source genetic materials.
CO3: Be attentive on reliability of molecular tools
CO4: Get awareness on production of consistent copy numbers of genetic material.
CO5: Be able to spot factual evidences in parenthood disagreement and as well as in crime situation.

COURSE: Experiments on

1. Bacterial Transformation
2. Isolation of Plasmid DNA
3. Restriction Digestion of DNA
4. Ligation of DNA
5. Polymerase Chain Reaction (PCR)
6. DNA finger printing

REFERENCES:

1. Sambrook J, Fritsch EF and Maniatis T. (2001). Molecular Cloning-A Laboratory Manual. 3rdedition. Cold Spring Harbor Laboratory Press.

2. Vennison, S. John (2009), Laboratory manual for Genetic Engineering, Prentice Hall India Learning Private Limited.

3. Dr. Sandhya Mitra, (2015) Genetic Engineering: Principles and Practice, 2nd Edition, McGraw Hill Education (India) Private Limited, New Delhi.

4. Dr. Anurudh K. Singh, Santhosh K. Tiwari & Dr. J. P. Yadav (2017), Practical Manual, Plant Genetic Engineering. https://www.researchgate.net/publication/322152584

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ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) , VISAKHAPATNAM

V SEMESTER **BIOTECHNOLGY** 2 Hrs/Week

BTH 5752 (2) **PLANT AND ANIMAL BIOTECHNOLOGY** Max. Marks:50

W.e.f. 2015-2018 (AC Batch) **PRACTICAL SYLLABUS – III B**

OBJCECTIVE: To acquire the techniques and inoculation methods in plant tissue culture

COURSE OUTCOMES: Students will

- **CO1:** Be expertise in formulating the concentrations of tissue culture media constituents
- **CO2:** Capable to identify the economized protocols for both the classical & hybrid varieties, with the available tissue culture concepts.
- **CO3:** Able to breed the haploid cultivars and enhance vegetative propagation. virus free stocks, flexible to current agriculture practice.

COURSE: Experiments on

1. Preparation of MS Media and its Chemical composition
2. Preservation of tissue culture plants under cold conditions
3. Pollen culture
4. Seed culture
5. Anther culture

REFERENCES:

1. Plant Tissue Culture : Theory and Practice By S.S. Bhojwani and A. Razdan,1998
2. Dr. Anurudh K. Singh, Santhosh K. Tiwari & Dr. J. P. Yadav (2017), Practical Manual, Plant Genetic Engineering. https://www.researchgate.net/publication/322152584

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

VI SEMESTER **BIOTECHNOLOGY** TIME: 3 Hrs/week

BTH-E1-6701(3)

INDUSTRIAL, MEDICAL, AGRICULTURAL & ENVIRONMENTALBIOTECHNOLOGY

W.e.f. 2019-20 admitted batch ("19AG" Batch) Max.Marks:100

SYLLABUS

OBJECTIVES: To enable the students to -

- Understand the role of biotechnology in industries.
- Know the use of microbes in the preparations of food and dairy product.
- Understand the role of biotechnology in the environment such bioremediation.

COURSE OUTCOMES: Students will

- **CO1:** Get the insight about the function and organization of industry.
- **CO2:** Be trained for industrial solvents production, with acquired basic design & fermenter operation. Also skilful in verification of protocols for dairy.
- **CO3:** Be proficient on health care products. Also be familiarized in generation and protection of patents, copyrights and trademarks.
- **CO4:** Apprise the importance of enhancing the green and clean environment.
- **CO5:** Be familiarize with microbial action on crop productivity.

COURSE:

UNIT – I: INDUSTRIAL BIOTECHNOLOGY – I

a. Introduction to industrial biotechnology.
b. Primary and secondary metabolic products of micro organisms.
c. Screening, isolation and preservation of industrial microorganisms.
d. Fermentation technology – principle, design and process. Definition of Bioreactor, Types of bioreactors – Batch, Fed- batch, Continuous.

UNIT – II: INDUSTRIAL BIOTECHNOLOGY – II

a. Ethanol production by fermentation using Molasses, Starchy substances. Production of alcoholic beverages- Beer & Wine.
b. Production of Citric acid by submerged & solid state fermentation.
c. Fermentative production of microbial enzymes – Amylase & Protease and antibiotics - Penicillin.
d. Fermentative production of foods.
e. Fermentative production of dairy products.

UNIT – III: MEDICAL BIOTECHNOLOGY

a. Production of health care products through r-DNA technology (insulin, hepatitis B vaccines)
b. Production of targeted proteins – human growth hormones, – production of alpha and beta interferon's, monoclonal antibodies
c. Good manufacturing practice, biosafety issues, bioethics
d. IPR and patenting issues

UNIT – IV: ENVIRONMENTAL BIOTECHNOLOGY

a. Introduction to environmental biotechnology.
b. Energy resources – Renewable and Non-Renewable
c. Treatment of municipal and industrial effluent
d. Degradation of pesticides and toxic chemicals

UNIT – V: AGRICULTURAL BIOTECHNOLOGY

a.Biopesticides and Biofertilizers (nitrogen fixing, phosphate solubilizing microorganisms)
b. Microbial leaching
c. Bioremediation - Biodegradation of recalcitrant compounds and the role of genetically engineered microbes.
d. SCP – SCP organisms and production

REFERENCES:

1. Food microbiology by M.R. Adams and M.O. Moss, Cambridge:Royal Society of Chemistry, 2007.
2. Industrial microbiology by L.E. Casida, John Wiley & Sons Inc, 1968.
3. Biotechnology and IPR'S and Biodiversity by M.B. Rao and Manjula, Pearson Education/Longman publishers, 2010.
4. Bioprocess Engineering by Shuler, Prentice Hall India Learning Private Ltd, 2nd edition, 2002.
5. Biotechnology – U. Satyanarayana, Books & Allied Ltd Publishers, 2008.

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

VI SEMESTER **BIOTECHNOLOGY** TIME:2 Hrs/week

BTH-E1-6751(2)

INDUSTRIAL, MEDICAL, AGRICULTURAL AND ENVIRONMENTAL BIOTECHNOLOGY

W.e.f. 2019-20 admitted batch ("19AG" Batch) **PRACTICALSYLLABUS** Max.Marks:50

OBJECTIVE: To enable the student to apply the different principles of Biotechnology in the preparationof different industrial products.

COURSE OUTCOMES: Students will

- **CO1:** Get hands-on training to produce industrial beverages on a productive scale.
- **CO2:** Proficient in checking the quality of industrial beverages and water.
- **CO3:** Expertise in the area of soil fertility and known about plant-microbe interactions.

COURSE:

1. Production of wine using yeast
2. Production of hydrogen and biogas using cow dung
3. Production of alcohol by fermentation & estimation of alcohol by Colorimetry
4. Production of Biofertilizers (*Azolla*)
5. To determine the dissolved oxygen (DO)
6. To find out the salinity in water
7. Isolation of *Rhizobium*

REFERENCES:

1. Manual of Industrial Microbiology and Biotechnology,II edition (1999) Arnold L.Demain and JuilanE.Davies.

2. Practical Manual- by Dr. Renu Gupta ,Dr. Seema Makhija ,Dr. Ravi Toteja

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