2024-25

GOVERNMENT COLLEGE FOR WOMEN(A)
GUNTUR

COURSE INFORMATION BOOKLET

DEPARTMENT OF BIOTECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

VISION

To cultivate graduates equipped with comprehensive education and practical skills in biotechnology, fostering their ability to innovatively and responsibly contribute to the environment and society, while advancing knowledge and understanding in the field.

MISSION

- **To** provide students with a comprehensive understanding of biotechnology, encouraging innovative and critical thinking to solve real-world problems.

- **To** equip students with practical skills through hands-on lab training, specialized courses, and industry-relevant programs for future career success.

- **To** prioritize high-quality teaching and promote strong industry connections, ensuring students gain valuable experience through internships and research opportunities.

- **To** foster a holistic learning environment that supports ethical values, social responsibility, and teamwork through active participation in co-curricular and extracurricular activities.

- **To** encourage a spirit of scientific inquiry and lifelong learning, preparing students to contribute meaningfully to advancements in biotechnology and related fields.

Program Specific Outcomes: B.Sc. Biotechnology

Biotechnology has made significant advances in recent years and emerged as a frontline area of research and development, with an overwhelming impact on the society.

Upon completion of the B.Sc. in Biotechnology, students will be able to:

1. PSO 1: Demonstrate in-depth knowledge of key concepts in Biotechnology, Botany, Zoology and Chemistry concepts in pursuing higher studies in Biotechnology and its allied areas.
2. PSO 2: Comprehensive understanding of biomolecules and their properties, microbes and their laboratory protocols along with proficiency in utilizing microbial, biophysical and biochemical techniques for the characterization and validation.
3. PSO 3: Command on the principles of r-DNA Technology and equippe with the knowledge and skills to apply biotechnological principles in various fields which helps in employment.

Subject: BIOTECHNOLOGY

w.e.f. AY 2024-25 COURSE STRUCTURE

MINOR

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	II	1	Biomolecules and Analytical Techniques – (T)	3	3
			Biomolecules and Analytical Techniques – (P)	2	1
II	III	2	Plant and Animal Biotechnology – (T)	3	3
			Plant and Animal Biotechnology – (P)	2	1
	IV	3	Immunology – (T)	3	3
			Immunology – (P)	2	1
		4	Bioinformatics and Biostatistics – (T)	3	3
			Bioinformatics and Biostatistics – (P)	2	1
III	V	5	Industrial Biotechnology – (T)	3	3
			Industrial Biotechnology – (P)	2	1
		6	Food & Nutritional Biotechnology – (T)	3	3
			Food & Nutritional Biotechnology – (P)	2	1

B.Sc. Biotechnology - Course Structure

(*with effect from the Academic Year 2020-21*)

SEMESTER	TITLE OF THE PAPER
I	Bio-Molecules & Analytical Techniques
II	Microbiology, Cell & Molecular Biology
III	Immunology & r-DNA Technology
IV	(i) Plant & AnimalBiotechnology
	(ii) Environmental & Industrial Biotechnology

Skill Enhancement Courses (SECs) for Semester V, from 2022-23
(Syllabus-Curriculum)
Structure of SECs for Semester – V
(To choose One pair from the Three alternate pairs of SECs)

Courses 6&7	**Name of Course**	**Th. Hrs/** We Ek	**IE Marks**	**EE Mar** ks	**Credits**	**Prac. Hrs/wk**	**Marks**	**Credits**
6A	Techniques in nursery Development	3	30	70	3	3	50	2
7A	Hydroponics Cultivation	3	30	70	3	3	50	2

OR

Courses 6&7	Name of Course	Th. Hrs/ Week	IE Mar ks	EE Mar ks	Credits	Prac. Hrs/wk	Marks	Credits
6B	Organic Farming	3	30	70	3	3	50	2
7B	Bio fertilizers and Bio pesticides production	3	30	70	3	3	50	2

OR

Courses 6&7	Name of Course	Th. Hrs/ Week	IE Mark s	EE Mar ks	Credits	Prac. Hrs/wk	Marks	Credits
6C	Apiculture	3	30	70	3	3	50	2

7C	Pearl Culture	3	30	70	3	3	50	2

Note-1: For Semester–V, for the domain subject Biotechnology any, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABCD allotment is random, not on any priority basis).

Note-2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented.
Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations

ASSESSMENT COMPONETS (2024-25)

I & II year Assessment in the ration of 60:40

Continuous Internal Assessment for I & II Year:

Mid Semester 1= 25 marks

Mid Semester 2= 25 marks

5 Assignments= 20 marks

Semesnars/ Project/GD/Quiz= 10 marks

Total 80 marks scaled down to 40 marks

Semester End Examination for I & II Year:

Section 1: 5x4=20marks (5 out of 8 without internal choice)

Section 2: 5x8= 40 marks (5 out of 8 with internal choice from each unit)

III year Assessment in the ration of 70:30

Continuous Internal Assessment for III Year:

Mid Semester 1= 20 marks

Mid Semester 2= 20 marks

5 Assignments= 10 marks

Seminars/ Project/GD/Quiz= 10 marks

Total 60 marks scaled down to 30 marks

Semester End Examination for III Year:

Section 1: 5x2=10marks (5 out of 8 without internal choice)

Section 2: 5x4=20marks (5 out of 8 without internal choice)

Section 3: 5x8= 40 marks (5 out of 8 with internal choice from each unit)

SEMESTER-II

COURSE 1: BIOMOLECULES AND ANALYTICAL TECHNIQUES

Theory Credits: 3 3 hrs/week

I. COURSE OUTCOMES

On successful completion of the course, the students will be able to

1. Demonstrate a comprehensive understanding of the fundamental principles and structures of bioorganic compounds, including carbohydrates, proteins, lipids, nucleic acids, vitamins, and their functions in biological systems.
2. Apply knowledge of various separation and analytical techniques, such as centrifugation, chromatography, electrophoresis, spectroscopy, microscopy, and PCR, for the qualitative and quantitative analysis of biomolecules and their applications in research and diagnostics.
3. Gain proficiency in basic statistical techniques, including descriptive statistics, analysis of variance, t-tests, and chi-square tests, to interpret and analyze experimental data, making informed decisions in biochemical and biotechnological research

I. Syllabus

Unit-I-Carbohydrates, Protein and Lipids

1. Classification, structure, properties of carbohydrates, amino acids, peptide bond and peptides.
2. Classification, structure (primary, secondary, tertiary, quaternary) and functions of proteins.Denaturation and renaturation of proteins.
3. Classification structure and properties of saturated and unsaturated fatty acids.

Unit-II- Nucleic acid, Vitamins, and Bioenergetics

1. Structure and functions of DNA and RNA.
2. Source, structure, biological role, and deficiency manifestation of vitamin A, B, C, D, E, and K.
3. Free energy, entropy, enthalpy, and redox potential.High energy compounds.
4. Glycolysis, Krebs cycle, Electron-Transport System and Oxidative

Phosphorylation.

Unit-III-Centrifugation, Chromatography, and Electrophoresis

1. Basic principles of sedimentation and types of centrifugations.
2. Principle, instrumentation, and application of partition, absorption, paper, TLC, ion exchange, gel permeation, and affinity chromatography.
3. Basic principles and types of electrophoresis, factors affecting electrophoretic migration. PAGE (Native, SDS-PAGE). Introduction to 2D & Isoelectric Focusing.

Unit - IV-Spectroscopy, Microscopy and PCR

1. Beer-Lambert law, light absorption and transmission. Extinction coefficient, Design and application of photoelectric calorimeter and UV-visible spectrophotometer.
2. Types and design of microscopes - compound, phase contrast, fluorescent electron microscopy (TEM, SEM).
3. PCR: Principle, Types and applications of PCR

Unit –V- Biostatistics

1. Mean, median, mode, standard deviation,
2. One-way ANOVA, Two-way Anova
3. t-test, F-test and chi-square.

III . Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. learn about basic instruments and their operation
2. learn about Qualitative and Quantitaive analysis of carbohydrates
3. Learn about estimations nucleic acids and protein by various methods
4. learn about the separation of molecules by chromatography and electrophoresis
5. Learn about problems on mean median mode

SEMESTER-II

COURSE 1: BIOMOLECULES AND ANALYTICAL TECHNIQUES

Practical Credits: 1 2 hrs/week

1. Introduction to basic instruments (Principle standard operation procedure) demonstration andrecord
2. Calculation of molarity, normality, and molecular weight of compounds.
3. Qualitative analysis of carbohydrates (sugars)
4. Quantitative analysis of carbohydrates
5. Quantitative estimation of protein - Lowery method
6. Estimation of DNA by diphenylamine reagent
7. Estimation of RNA by orcinol reagent
8. Assay of protease activity
9. Preparation of starch from potato and its hydrolyze by salivary amylase
10. Preparation of standard buffer and pH determination
11. Separation of amino acids by paper chromatography
12. Separation of lipids of TLC
13. Agarose gel electrophoresis
14. Calculation of mean, median and mode

V. REFERENCES

1. Outlines of Biochemistry, 5th Edition, (2009), Erice Conn & Paul Stumpf; John Wiley and Sons,USA
2. Principles of Biochemistry, 4th edition, (1997), Jeffory Zubey; McGraw-Hill College, USA
3. Principles of Biochemistry, 5th Edition (2008), Lehninger, David Nelson & Michael Cox; W.H.Freeman and Company, NY
4. Fundamentals of Biochemistry, 3rd Edition (2008), Donald Voet & Judith Voet; John Wiley andSons, Inc. USA
5. Biochemistry, 7th Edition, (2012), Jeremy Berg & Lubert Stryer; W.H.Freeman and Company,NY
6. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGrawHill Edu. Pvt.Ltd. New Delhi, India
7. Biochemical Methods,1st Edition, (1995), S.Sadashivam, A.Manickam; New Age InternationalPublishers, India
8. Textbook of Biochemistry with Clinical Correlations, 7th Edition,

(2010), Thomas M. Devlin;John Wiley and Sons, USA

9. Proteins: biotechnology and biochemistry, 1st edition, (2001), Gary Walsch; Wiley, USA

10. Biochemical Calculations, 2nd Ed., (1997), Segel Irvin H; John Wiley and Sons, NY

11. Biophysical Chemistry Principles & Techniques Handbook, (2003), A. Upadhyay, K.Upadhyay, and N. Nath

12. Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001), Palmer Trevor, Publisher:Horwood Pub. Co., England.

13. Analytical Biochemistry, 3rdedition, (1998), David Holmes, H.Peck, Prentice-Hall, UK

14. Introductory Biostatistics, 1st edition, (2003), Chap T. Le; John Wiley, USA.

15. Methods in Biostatistics, (2002), B. K. Mahajan –Jaypee Brothers.

16. Statistical methods in biology, (1995), Bailey, N. T.; Cambridge university press

VI. CO-Curricular Activities

a) **Suggested C0-Curricular Activities**

1. Assignments
2. Seminars, Group Discussions on related topics
3. Charts preparation on vitamins

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

B.sc Biotechnology semester II -2024-25

Paper I: BIOMOLECULES AND ANALYTICAL TECHNIQUES

Model question paper

Time:3Hrs **Marks:60M**

Section:A

l.Answer any 5 questions each question carries 4M **5×4=20M**

1. Explain Glycolysis.
2. Define the Density gradient centrifugation.
3. Describe the Compound microscope.
4. Extend Real time PCR.
5. Write about Standard deviation.
6. Discuss Isoelectric focusing.
7. What are Saturated fatty acids
8. Describe the principle of TLC

Section: B

ll Answer the following questions **5×8=40**

9 .a) Give an account on structural classification and properties of amino acids.

(Or)

b) Describe the structural classification and properties of carbohydrates.

10.a) Outline the TCA cycle.

(Or)

b) Write about structure and functions of DNA.

11.a) Describe the separation of the compounds by using paper chromatography.

(Or)

b) Write about SDS- PAGE Electrophoresis.

12.a) Define Beer – Lambert's law and applications of UV – visible spectrophotometer.

(Or)

b) Illustrate the principle and procedure of PCR.

12.Explain the following:

a) Mean, Median. (Or)

b) Anova.

SEMESTER-III

COURSE 2: PLANT AND ANIMAL BIOTECHNOLOGY

Theory Credits: 3 3 hrs/week

I. COURSE OUTCOMES

On successful completion of the course, the students will be able to

1. Understand the principles and applications of plant tissue culture techniques, including micropropagation and somatic embryogenesis, along with the importance of secondary metabolites in plants.
2. Proficiency in plant transformation technology, transgenic plant production, and the application of molecular markers (RAPD, RFLP) for genetic analysis.
3. Develop practical skills in animal tissue culture, transfection methods, and gain insights into the ethical considerations of biotechnology, biosafety measures, and intellectual property rights.

II. Syllabus

Unit – I Plant tissue culture techniques & secondary metabolites production

1. Tissue culture laboratory facilities, totipotency, media preparation – nutrients and plant hormones; sterilization techniques; establishment of cultures – callus culture, cell suspension culture
2. applications of tissue culture-micro propagation; Somatic embryogenesis
3. synthetic seed production; protoplast culture and somatic hybridization - applications. Cryopreservation, Plant secondary metabolites- concept and their importance

Unit – II_Transgenesis and Molecular markers

1. Plant transformation technology—Agrobacterium-mediated Gene transfer (Ti plasmid), hairyroot features of Ri plasmid, Transgenic plants as bioreactors.
2. Herbicide resistance – glyphosate, Insect resistance- Bt cotton
3. Molecular markers - RAPD, RFLP and DNA fingerprinting-principles and applications.

Unit – III Animal tissue culture techniques

1. cell culture media and reagents; characteristics of cells in culture: primary culture, secondary culture, cell lines,stem cell cultures;
2. Tests: cell viability and cytotoxicity, Cryopreservation.
3. Transfection methods (calcium phosphate precipitation, electroporation, Microinjection) andapplications.

Unit – IV Transgenic animals & Gene Therapy

1. Production of vaccines, diagnostics, hormones and other recombinant DNA products inmedicine (insulin, somatostatin, vaccines),IVF in animals
2. Concept of Gene therapy,
3. Concept of transgenic animals – Merits and demerits

Unit V. Bioethics, Biosafety and IPR

1. Bioethics in cloning and stem cell research, Human and animal experimentation, animalrights/welfare.
2. Bio safety-introduction to biological safety cabinets; primary containment for biohazards;biosafety levels; GLP,GMP
3. Introduction to IP-Types of IP: patents, trademarks & copyright

III . Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. Learn about different plant tissue media
2. Learn about the induction of callus from explants
3. Learn about plant propagation of through various tissue culture
4. Learn about cell lines
5. Learn about cell viability by various methods

SEMESTER-III

COURSE 2: PLANT AND ANIMAL BIOTECHNOLOGY

Practical Credits: 1 2 hrs/week

1. plant culture media and composition of MS media
2. Raising of aseptic seedlings
3. Induction of callus from different explants
4. Plant propagation through Tissue culture (shoot tip and Nodal culture)
5. Establishing a plant cell culture (both in solid and liquid media)
6. suspension cell culture
7. Cell count by hemocytometer.
8. Establishing primary cell culture of chicken embryo fibroblasts.
9. Animal tissue culture – maintenance of established cell lines.
10. ELISA – Demonstration

V. REFERENCES

1. 1..Introduction to Plant Tissue Culture..M.K. Razdan ,2003,Science Publishers
2. Plant Tissue Culture, kalyan Kumar De,199 M7,New Central Book Agency
3. Plant Tissue Culture : Theory and Practice By S.S. Bhojwani and A. Razdan,1998
4. Biotechnology – By U. Satyanarayana ;1997
5. Plant Cell, Tissue and Organ Culture, Applied and Fundamental Aspects By Y.P.S. Bajaj and A.Reinhard ,2001
6. Introduction to Plant Tissue Culture,M. K. Razdan, 2003,Science Publishers

7. A Textbook of Biotechnology,R C Dubey,S. 2014,Chand Publishing

8. Elements of Biotechnology,P. K. Gupta, 1994,Rastogi Publications

9. R. Ian Freshney, "Culture of animal cells – A manual of basic techniques" 4th edition, John Wiley &Sons, 2000 ,Inc, publication, New York
10. Daniel R. Marshak, Richard L. Gardner, David Gottllieb "Stem cell Biology" edited by Daniel2001,Cold Spring Harbour Laboratory press, New York
11. M.M. Ranga, Animal Biotechnology; Agrobios (India) ,2006.

VI. CO-Curricular Activities

a) Suggested C0-Curricular Activities

1. Assignments
2. Seminars, Group Discussions on related topics
3. Charts on different medias
4. Visit to plant tissue culture lab

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

B.sc Biotechnology semester III -2024-25

Minor Paper: Plant & Animal Biotechnology

Model question paper

Time:3Hrs **Marks:60M**

Section:A

I. Answer any 5 questions. Each question carries 4M. **5×4=**20M

1. Describe MS Medium
2. Explain Suspension culture
3. Discuss the importance of Bt Cotton
4. Elaborate the mechanism of Micro injection
5. Summarize the production of recombinant Insulin
6. Explain Micro Propagation
7. Define Animal rights
8. Explain Edible Vaccines

Section-B

III. Answer the following questions. **5×8=40M**

9. a) Explain different types of Sterilization techniques

(Or)

b) Describe the composition &Preparation of Callus Culture

10. Illustrate the following:

a) Ti plasmid

Ri plasmid

(or)

b) RAPD

RFLP

11. a) Give an detail account on Animal cell culture

(Or)

b) Calcium phosphate precipitation

Electroporation

12. a) Give an detail account on IVF

(Or)

b) Write about Gene therapy

13. a) Explain Bioethics in Cloning &Stem Cell research

(Or)

b) Define Bio safety? Write Primary Containment for biohazards.

SEMESTER-IV COURSE 3: IMMUNOLOGY

Theory Credits: 3 3 hrs/week

I. LEARNING OUTCOMES

On successful completion of the course, the students will be able to

1. Learn about types of immunity and cells of immunity
2. Learn about Antigen and Antibody
3. Learn about cell , humoral immunity and MHC molecules
4. Learn about Hypersensitivity and vaccines
5. Learn about immunological techniques

II. Syllabus

UNIT I Immune system:

1. History and scope of immunology, cells of imthe mune system -Tcells , B cells
2. Immunity, innate immune mechanism, Acquired immune mechanism
3. Organs of the immune system (Bone marrow, spleen thymus MALT)

UNIT II Antibody and Antigen:

1. Antibody structure and classes(Ig G, Ig M, Ig A, Ig E, I g D , Antibody diversity)
2. Antigen -Types of Antigens Antigenicity (factors affecting antigenicity).
3. Antigenic determinants – adjuvants and haptens , epitopes

UNIT III Immunity:

1. Humoral immunity, cell-mediated immunity -TC-mediated immunity, NK cell-mediated immunity, ADCC,
2. brief description of cytokines , Interleukins and complement system.
3. Major histocompatibility complex (MHC)-Structure and Functions of Class I ,II , MHC Molecules

UNIT IV Hypersensitivity and vaccination : Autoimmunity

1. General features of hypersensitivity, various types of hypersensitivity,Introduction to autoimmunity
2. Vaccination: Discovery, principles, significance,
3. Types of Vaccines -live, attenuated, killed , recombinant, subunit

UNIT V Immunological Techniques

1. Antigen-antibody reactions: Precipitation, agglutination, immunodiffusion, - Radial immune diffusion, ouchterlony , double immune diffusion
2. Hybridoma technology: Monoclonal antibodies and their applications in immunodiagnosis.
3. ELISA , RIA , immunoelectrophoretic ,

III . Skills Outcome

On Successful Completion of this Course, the Student shall be able to

1. Learn about the determination of blood group
2. Learn about immunodiffusion methods
3. Learn about production of antibodies

SEMESTER-IV

COURSE 3: IMMUNOLOGY

Practical hrs/week	Credits: 1	2

IV . Practical Syllabus: Hours 2 hours per week = 30 hours

1. Antigen – antibody reaction – determination of Blood group , Cross reactivity
2. Pregnancy test
3. Widal test
4. Ouchterloney immunodiffusion
5. Radial immunodiffusion
6. ELISA
7. Isolation of casein by isoelectric precipitation
8. Production of antibodies and their titration

V. REFERENCES

1. Kuby immunology, Judy Owen, Jenni Punt, Sharon Stranford., 7th edition (2012), Freeman andCo., NY
2. Textbook of basic and clinical immunology, 1st edition (2013), Sudha Gangal and ShubhangiSontakke, University Press, India
3. Immunology, 7th edition (2006), David Male, Jonathan Brostoff, David Roth, Ivan Roitt,Mosby, USA.
4. Immuno diagnostics, 1996, By S.C. Rastogi, Publ: New Age
5. Introduction to Immunology- 2002, C. V. Rao- Narosa Publishing House

VI. CO-Curricular Activities

a) **Suggested C0-Curricular Activities**

1. Assignments
2. Seminars, Group Discussions on related topics
3. Charts on cell mediated immunity
4. Models on antibodies

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

B.sc Biotechnology semester IV -2024-25

Minor Paper: Immunology

Model question paper

Time:3Hrs **Marks:60M**

Section:A

I. Answer any 5 questions. Each question carries 4M. **5×4=**20M

1. Macrophages

2. T-Lymphocytes

3. Antibody diversity

4. Adjuvants

5. Interleukins

6. Humoral Immunity

7. Principle of vaccination

8. Autoimmunity

9. Complement Fixation Test

10. ELISA

Section-B

III. Answer the following questions. **5×8=40M**

11. A. Describe the organs of immune system.

OR

B. Describe innate and acquired immunity with examples.

12. A. Explain the structure of antibody and mention different classes of antibodies.

OR

B. write about types of antigens and the factors affecting antigenicity.

13. A. Describe MHC structure, classes and functions in detail.

OR

B. Describe cell mediated immunity.

14 A. Define hypersensitivity and mention types of hypersensitivity with suitable examples.

OR

B. Define vaccination and explain various types of vaccines.

15. A. Write about Hybridoma technology and its importance.

OR

B. Explain single and double immunodiffusion

SEMESTER-IV

COURSE 4: BIOINFORMATICS AND BIOSTATISTICS

Theory | Credits: 3 | 3 hrs/week

I. LEARNING OUTCOMES

On successful completion of the course, the students will be able to

- Learn about concept and branches of bioinformatics
- Learn about searching sequences using databases
- Learn about computer phylogenetics
- Learn about the measurement of central tendency
- Learn about test hypothesis

II. Syllabus

UNIT – I

1. Scope of computers in biological research, Introduction to Bioinformatics: Definition, nature and scope of bioinformatics.
2. Bioinformatics versus computational biology.
3. Branches of bioinformatics. Basic concepts in bioinformatics.

UNIT – II

1. Basic concepts of system biology. Biological databases.
2. Overview of computer-aided drug design.
3. Searching sequence database using BLAST. Concept of genomics and proteomics

UNIT – III

1. Computational phylogenetics – various applications.
2. Phy lip software. Microarray,
3. Bio informatics – Experimental design & Over view of data analysis.

UNIT – IV

1. Measurement of central tendency (mean, mode and range)
2. Dispersion (standard error and standard deviation).
3. Probability and distribution. Poisson and binomial distributions. Normal distribution

UNIT – V

1. Population and sampling test of significance. Test hypothesis.
2. Student t-test for small samples. ANOVA (one way) ,Chi^2 test for analysis, correlation and regression.
3. Computer applications in Biotechnology

III . Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. Learn about problems of mean median mode
2. Learn about test hypothesis
3. Learn about sequence Retrieval from NCBI

SEMESTER-IV

COURSE 4: BIOINFORMATICS AND BIOSTATISTICS

Practical | Credits: 1 | 2 hrs/week

1. Mean, Median, Mode
2. Standard deviation, variance and coefficient of variation
3. Testing of hypotheses regarding population mean
4. Testing of hypotheses about the difference between population means
5. Chi-square test
6. Testing of Correlation Coefficient
7. Fitting of simple linear regression
8. Sequence retrieval (protein and gene) from NCBI, Structure download (protein andDNA)from PDB

V. REFERENCES

1. Fowler, J., Cohen, L. and Jarvis, P. (1998). Practical Statistics for Field Biology. John Wiley andSons, 2nd ed. .
2. Bland, M. (2006). An Introduction to Medical Statistics. Oxford University Press, 3rd ed.
3. Finney, D.J. (1980). Statistics for Biologists.Chapman and Hall Ltd.
4. Wayne, W, Daniel (1999). Biostatistics: A Foundation for Analysis in Health Sciences. John Wileyand Sons, 7th ed.

VI. CO-Curricular Activities

a) **Suggested C0-Curricular Activities**

1. Assignments
2. Seminars, Group Discussions on related topics
3. Charts on data bases

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

B.sc Biotechnology semester IV -2024-25

Minor Paper: Bioinformatics & Biostatistics

Model question paper

Time:3Hrs **Marks:60M**

Section:A

I. Answer any 5 questions. Each question carries 4M. **5×4=**20M

1. Computational Biology

2. Computers in biological research

3. BLAST

4. Proteomics

5. Microarray

6. Brief account on PHYLIP

7. Mean

8. Normal distribution

9. Chi square test

10. Regression

Section-B

III. Answer the following questions. **5×8=40M**

11. A. Write about definition, nature and scope of bioinformatics in India.

OR

B. Explain the basic concept and different branches of bioinformatics.

12. A. Describe computer-aided drug design.

OR

B. Explain the Protein data bases.

13. A. Define computational phylogenetics and mention its applications.

OR

B. Describe the outlines of experimental design and data analysis using bioinformatics.

14 A. Write an essay on probability distributions.

OR

B. Describe the measures of dispersion.

15. A. Write about ANOVA.

OR

B. Define correlation. Explain positive and negative correlation with graph.

Domain Subject : Biotechnology

B.Sc Semester- V

Course: 6B – Organic Farming

(Skill enhancement course (Elective), 05 credits)

Course Code: **BT405-6B**

I. COURSE OUTCOMES

Students after successful completion of the course will be able to

1. Appreciate the importance of organic manure and bio fertilizers
2. Produce vermi compost, farmyard manure from bio waste
3. Acquire skill on isolation and maintenance of bio fertilizers

II. SYLLABUS

UNIT -1 - Soil

Definition, soil formation, composition and characteristics. Types of soils.. Acidic, Alkaline and heavy metal contaminated soil. Methods of reclamation. Effects of chemical dependant farming on yield and soil health.

UNIT-2 - Plant Nutrition

Macro and micro nutrients, functions of nutrients in plant growth and development. Nutrient uptake and utilization by plant. Types of fertilizers. Organic, inorganic and bio fertilizers. Chemical fertilizer. Advantages & disadvantages of their use. Importance of organic and bio fertilizers.

UNIT -3 - Organic Farming

Definition, concept, benefits. Integrated farming system (combination of organic and inorganic). Mixed farming system. Concept of different cropping systems in relation to organic farming, Inter cropping, crop rotation. Organic farming process. Organic fertilizers, crop nutrients and effective microorganisms in Organic farming.

UNIT- 4 - Organic compost

Definition, types of compost, farm yard compost, green leaf compost, animal husbandry, animal housing, animal feeding, animal health, breeding goals.

Vermi compost: Introduction, vermi composting material, species of earthworms, small scale, large scale composting process. Vermi castings, harvesting, processing and drying. Nutrient content of vermi compost. Field application methods.

UNIT –5- Biofertilizers

Introduction, status and scope. Structure and characteristic features of bacterial bio fertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*. Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Mechanism of nitrogen fixation and phosphorussolubilization

Practical syllabus: Course 6B Organic farming

III. Skill outcomes:

On successful completion of the practical course, student shall be able to

1. Estimate NPK levels in the soil
2. Demonstrate the collection and processing of raw material
3. Develop skill of vermi compost production
4. Learn the technique of establishing organic farms
5. Equip with the skill of preparation of microbial media

IV. Practical syllabus:

1. Collection of different soil samples
2. Qualitative estimation of nitrogen, phosphorus and potassium in soil samples
3. Collection of fruit, vegetable and other domestic waste
4. Preparation of compost beds and introducing earthworms
5. Collection of vermi castings
6. Sieving, drying and packing of vermi compost
7. Visit to animal shed and observing farm yard manure production
8. Preparation of media and isolation of bio fertilizers

V. References:

1. Principles of Organic Farming:: by E Somasundaram,D Udhaya

Nandhini,M Meyyappan **;2021**
2. Organic farming in India:: by Arpita Mukherjee; 2017
3. Biofertizer and biocontrol agents for agriculture;; by AM Pirttilä · 2021
4. Trends in Organic Farming in India;; by S. S. Purohit, 2006
5. Biofertilizers for Sustainable Agriculture and Environment;;
by Bhoopander Giri Ram Prasad, Qiang-Sheng Wu, Ajit
Varma; 2019

VI. Co-curricular activities:

a) Mandatory:(Training of students by teacher on field related skills;15hrs)

1. **For teacher;** Training of students by teacher in laboratory and field for a total of 15hrs on soil sample collection, NPK analysis, collection of biodegradable waste, vermi composting, collection of castings, processing, drying& packing. In addition teacher should demonstrate the media preparation, sterilization, and isolation of microorganisms from soil.
2. **For students:** Visit to local organic farm, collection of earthworms, observing the crop growth raised in organic farms. Submission of field work report of 10 pages in the prescribed format.
3. Maximum marks for field work report:05
4. Suggested format for field work report: Title page, student details, content page, introduction, work done, findings, conclusion and acknowledgements.
5. Unit test (IE)

b) Suggested co-curricular activities

1.Comparing mineral content in different agricultural soil

2 .Learning techniques of basic instruments handling related to field work

3.Preparation of videos on compost preparation and application

4.Visit to local organic field

5.Attending special lectures, group discussions and seminars on organic farming.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

B.sc Biotechnology semester V -2024-25

Paper 5: Organic farming

Model question paper

section : A

Time:3Hrs **Marks:70M**

l. Answer any 5 questions each question carries 2M **5×2=10M**

1. What are Micronutrients?
2. What is Organic farming ?
3. Explain Bio fertilizer?
4. Discuss Crop rotation?
5. List the uses of Compost?
6. Write on Breeding goals?
7. Explain Harvesting of vermicompost?
8. Give the Field application methods?

Section:B

ll. Answer any 5 questions each question carries 4M **5×4=20M**

9. What are the Types of soils
10. Compare the Effects of chemical dependent farming on yield and soil health
11. Distinguish the Advantages & disadvantages of chemical fertilizers
12. Explain Mixed farming system

13 Discuss on .Inter cropping

14 What are .Nutrient content of vermi compost

15 List out importance of .Bacillus biofertilizer

16.Explain use of Anabaena biofertilizer

Section: C

lll Answer the following questions **5×8=40**

17.a) Write about organic farming, soil formation, compostion & characteristics.

(Or)

b) Give an detail account on Acidic, Alkaline and heavy metal contaminated soil.

18.a) Discribe the macro & micro nutrients and their functions in plant growth and development

(Or)

b) Explain organic, inorganic & bio fertilizers

19.a) Write about integrated farming system

(Or)

b) Write the crop nutrients and effective micro organisms in organic farming

20.a) Give a detail account on types of compost

(Or)

b) Discuss about vermi composting material & process of vermi compost

21.a) Write about structure & characteristics features of Rhizobium bio fertilizer

(Or)

b) Explain AM mycorrhiza fungal bio fertilizer

Domain Subject : Biotechnology

B.Sc Semester-V

Course: **7B :Biofertilizers & Bio pesticides production**

(Skill enhancement course (Elective),05 credits)

Course Code: **BT405-7B**

1.Learning Outcomes:

On successful completion of the practical course, student shall be able to

1. Understand the importance of bio fertilizers for sustainable agriculture.
2. Appreciate the role of VAM in P solubilisation
3. Define bio pesticide and its nature
4. Produce bio fertilizers and bio pesticides on large scale
5. Able to prepare inoculums for field application

II. SYLLABUS

UNIT -1-Biofertilizers

Introduction, history, concept, scope of bio fertilizers in India. Classification, microorganisms used as bio fertilizers. Bacterial, fungal and algal bio fertilizers. Symbiotic and a symbiotic microorganisms. Mechanism of nodulation and nitrogen fixation.

UNIT – 2- Mycorrhizal bio fertilizers

Importance, types, characteristic features of ecto and endo mycorrhiza. Mechanism of phosphorus solubilisation. Uptake of phosphates by the roots. Consortium based inoculums and significance.

UNIT-3 - Bio pesticides

Definition, concept, history, scope and importance of bio pesticides.

Classification - botanicals, bacterial, fungal and viral based bio pesticides. Mechanism of action of

Bacillus thuringiensis and *Trichoderma viridae* as bio control agents.

UNIT -4 - Mass production techniques

Media, types, preparation. Methods of isolation, streak plate, spread plate and pour plate techniques, purification and identification of microorganisms used as bio fertilizers and bio pesticides. Mass production and packing techniques

UNIT- 5 - Field application methods

Preparation of carrier based inoculum. Sphagnum, peat, vermiculite as inoculums carriers. Dosage standardisation. Seed treatment, foliar application, root dressing and soil application techniques.

Storage and maintenance of inoculum.

Practical syllabus: Course 7B Bio fertilizers and Bio pesticides Production

II. Skill outcomes:

On successful completion of the practical course, student shall be able to

1. Prepare bacterial and fungal media
2. Isolate and identify symbiotic and free living nitrogen fixing bacteria
3. Isolate fungal bio control agents from soil samples.
4. Develop skill for large scale production of micro organisms
5. Learn field application techniques of biofertilizers and biopesticides

III. Practical syllabus:

1. Preparation of Nutrient agar, YEMA, and PDA media
2. Isolation of *Rhizobium* from root nodules
3. Isolation of *Azatobacter* from soil samples
4. Isolation of *Trichoderma*
5. Gram staining of bacteria
6. VAM root staining
7. Raising of legume seedlings with *Rhizobium* treatment
8. Visit to commercial bio control units and Krishi seva Kendra

IV. References:

1. Biofertilizers: Commercial Production Technology and Quality Control, 2017 by Dr. P.Hyma
2. Biofertilizers Technology, 2010, by S.Kaniyan, K.Kumar and K. Govinda rajan
3. Biofertilizers for Sustainable Agriculture, 2017; by Arun K Sharma
4. Advances In Plant Biopesticides 2021, by Dwijendra Singh, Springer India
5. A Textbook of Integrated Pest Management, 2013by Ram Singh & Vikas Jindal G.S. Dhaliwal

V. Cocurricular activities:

a) **Mandatory:** (Training of students by teacher on field related skills: 15hrs)

1. **For teacher:** Training of students by teacher on preparation of different microbial media, isolation techniques – streak plate , spread plate, pour plate, Grams staining of bacteria , VAM and Trichoderma observation. Preparation of Rhizobium inoculum and application to legume seedlings.
2. **For students:** Raising of seedlings of Leguminaceae species, maintaining of the seedlings in nursery/green house. Comparing the growth of seedlings treated with biofertilizer and chemical fertilizer.

Visit to Bio fertilizer and Bio pesticides commercial lab. Submission of field work report of 10 pages in the prescribed format.

3. Maximum marks for field work report:05
4. Suggested format for field work book; Title page, student details, content page, introduction, work done, findings, conclusion and acknowledgements.
5. Unit test (IE).

b) Suggested co-curricular activities;

1. Training of students by the industrial experts
2. Identification and collection of botanical pesticides
3. Assignments/seminars/group discussion /quiz on bio fertilizers and bio pesticides
4. Preparation of videos, charts on inoculum development and field application
5. Attending invited guest lectures on the concern topics

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

B.sc Biotechnology semester V -2024-25

Paper 5: Biofertilizers and Bio Pesticides Production

Model question paper

section : A

Time:3Hrs **Marks:70M**

l. Answer any 5 questions each question carries 2M **5×2=10M**

1. What are Symbiotic organisms
2. Explain ecto mycorrhiza
3. Discuss Bio pesticides
4. What is Mass Production
5 Explain. Inoculum
6. Discuss Peat
7. What is Root dressing
8. Define Packing

Section:B

ll.Answer any 5 questions each question carries 4M **5×4=20M**

9. What are symbiotic Micro organisms
10. Dicuss Uptake of phosphates by roots
11. Compare the History & importance of bio pesticides
12.Explain Mass Production media and Preparation
13. Classify Botanical bio pesticides
14. What is Trichoderma Viridae
15. Give an account on Spread plate method
16. Write about Seed treatment

Section: C

lll Answer the following questions **5×8=40**

17.a) Write about history and Scope of bio fertilizers in india

(Or)

b) Give an detail account on algal biofertilizers

18.a) Explain importance & types of endo mycorrhiza

(Or)

b) Describe the mechanism of Phosphorus Solubulization

19.a) Explain the Classification of Viral based bio pesticides

(Or)

b) Describe the mechanism of Bacillus turingenesis

20.a) Write the methods of Isolation Plating techniques

(Or)

b) Write about Purification & identification of microorganisms used as biofertilizers

21.a) Write about applications of Foliar and Soil

(Or)

b) i) Vermiculite

ii) Sphagnum

Department of Biotechnology
Skill Enhancement Certificate Course

EXPLORING BIOINFORMATICS- AN INTRODUCTORY CERTIFICATE COURSE

Course Objectives:

- To enable the students to retrieve protein data from data bases
- To impart the knowledge of comparison of sequences and structure prediction
- To analyze the proteomics and interpret using UNIPROT and other secondary structure prediction tools.
- To give the basic structure of protein, levels of organization of protein help the student to search the sequence data form available data bases.
- To give them hands on training on three dimensional structure prediction and analysis of proteins using soft ware is a rapidly growing technology for designing drugs, creates lot of enthusiasm among the students to take up career in Bioinformatics.

Course Outcomes:

- The basic structure of protein, levels of organization of protein helped the student to retrieve the sequence data form available data bases.
- The three dimensional structure prediction and analysis of proteins using soft ware is a rapidly growing technology for designing drugs, creates lot of enthusiasm among the students to take up career in Bioinformatics
- Exploring the UNIPROT and other secondary structure prediction are important in understanding the differential protein expression in several disease conditions

Course Syllabus

No. of Hours: 60 hours

UNIT-I

History of Bioinformatics. The notion of Homology. Sequence Information Sources, EMBL, GENBANK, Entrez, Unigene, Understanding the structure of each source and using it on the web. Searching Databases: SRS, Entrez, Sequence Similarity arches-BLAST, FASTA, Data Submission. Genome Annotation: Pattern and repeat finding, Gene identification tools

UNIT II

Sequence and Phylogeny analysis, Detecting Open Reading Frames, Outline of sequence Assembly, Mutation/Substitution Matrices, Pairwise Alignments, Introduction to BLAST, using it on the web, Interpreting results, Multiple Sequence Alignment, Phylogenetic Analysis.

UNIT- III

Protein Information Sources, PDB, SWISSPROT, TREMBL, Understanding the structure of each source and using it on the web. Introduction of Data Generating Techniques and Bioinformatics problem posed by them- Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass Spectrometry.

PRACTICALS

1. Sequence information resource

2. Understanding and use of various web resources: EMBL, Genbank, Entrez, Unigene, Protein information resource (PIR)

3. Understanding and using: PDB, Swissprot, TREMBL

4. Using various BLAST and interpretation of results.

5. Retrieval of information from nucleotide databases.

6. Sequence alignment using BLAST.

7. Multiple sequence alignment using Clustal W.

SUGGESTED READING

1. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.

2. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley-Blackwell.

3. Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings.

References:

1. Introduction to Bioinformatics by Aurther M lesk

2. Developing Bioinformatics Computer Skills By: Cynthia Gibas, Per Jambeck

3. NCBI https://www.ncbi.nlm.nih.gov/

4. PDB https://pdb101.rcsb.org/

5. Uniprot http://www.uniprot.org/

Course design:

The course is designed for BSc Biology stream students and it contains three units. The total instructional hours for the course will be 60hours.

Student evaluation:

The students will be evaluated at the end of the course with a final examination for 50marks. The final examination contains 60 multiple choice questions of which student must answer at least 50 questions. The question paper would be designed by giving twenty questions from each of 3 units. Each question carries 1 mark. This is a pass/fail course in which student must secure minimum of 25marks in the final examination.