Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

ARTS, COMMERCE & SCIENCE COLLEGE,

NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: Certificate course

Revised Syllabus of Bioinformatics

Choice Based Credit & Grading System (60:40)

w.e.f. Academic Year 2019-20

Sr. No.	Heading	Particulars
1.	Title of Course	Certificate Course in Bioinformatics
2.	Eligibility for Admission	F.Y. Class
3.	Duration	60Hrs. (One Academic Year)
4.	Fee	Rs. 500/-
5.	Number of students	As per the demand of the students
6.	Level	U.G.
7.	Pattern	Annual (50 Marks)
8.	Status	Revised
9.	To be implemented from Academic year	2019-2020

Infrastructure Requirements:

- Well Equipped Lecture room
- Well Equipped Laboratory
- Library with relevant books
- LCD Projector

Staff Requirement:

- A coordinator who will be responsible for the smooth conduct of the course.
- Coordinator of the course may be paid an Honorarium of Rs.1000/- per year
- A lecture and practical can be conducted by the core faculty or visiting having expertise in concerned field. Guest Faculty/internal Faculty may be remunerated @ Rs.200/- per lecture of 1 hr. Duration.
- Faculty must possess at least a Bachelor Degree with a expertise respective filed.
- Faculty from industry and research institutes.

Theory Question Paper Pattern:

Question 1	From Unit 1, 2	20 marks
Question 2	From Unit 1	15 marks
Question 3	From Unit 2	15 marks
	Total	50 marks

Course content:

Course Name	Contact Hours				Credits			
	Paper-I	Paper-II	Practical	Project/ Industrial Visit	Theory	Practical	Project/ I.V.	Total Credits
Certificate course in Bioinformatics	15	15	15	15	02	01	01	04

Total Duration: 60 hrs (One academic Year).Theory: 30 hrs. Practical :15Hrs; Project/ I.V. / Case study: 15Hrs

Course Objectives:

1. Comprehend the basic concepts and significance of bioinformatics in biological research and its applications in various fields.
2. Navigate and effectively use major biological databases to retrieve, store, and manage biological data.
3. Apply bioinformatics tools to analyze DNA, RNA, and protein sequences for similarity, motifs, and functional predictions.
4. Create visual representations of biological data and hands-on Experience with Bioinformatics Tools such as molecular structures, phylogenetic trees, and sequence alignments.

Course Outcomes:

Upon successful completion of the course, participants will be able to:

1. Efficiently navigate and retrieve information from various bioinformatics databases and resources.
2. Perform sequence alignment, motif identification, and functional annotation of biological sequences.
3. Predict Protein Structures: Use computational methods to predict protein structures and understand their implications for function.
4. Generate visual representations of biological data using appropriate visualization tools.

Syllabus: Certificate Course in Bioinformatics

Course Code: USCCBIO

Course outcome: *Upon completion of this course, the learners will be able to:*

- *Utilize online resources and database to gain access to biological data and literature information.*
- *Identify recent trends in proteomics, genomics, toxico-genomics and systems biology.*
- *Predict the structure for given protein sequence using software.*
- *Predict suitable experimental design for biological experiment and interpret the output adequately.*

Paper 1 (50marks)

Unit 1- **INTRODUCTION TO BIOINFORMATICS**

1.1: Definitions, Nature and Scope of Bioinformatics,

1.2: Objective and goals of bioinformatics.

1.3: Multidisciplinary, interdisciplinary approaches in Bioinformatics or computational biology.

1.4: The career options in bioinformatics

Unit 2: **CELL AND BASICS OF BIOLOGY**

2.1: Cell

2.2 DNA, RNA, and the Flow of Genetic Information

2.3: Central dogma

2.4: DNA replication and RNA transcription and translation.

Paper 2 (50marks)

UNIT 1: BASICS OF COMPUTERS

1.1: Introduction, Types and structure of Computers

1.2: Hardware and software Components

1.3: Software used in bioinformatics

1.4: Biological databases

1.4.1The different types and major Databases in Bioinformatics

1.4.2: Applications of Bioinformatics

1.4.3: Computer software used in bioinformatics

UNIT2: INTERNET AND WORLD WIDE WEB USED IN BIOINFORMATICS AND DATA MINING

2.1: History of Internet and WWW. Meaning of Data Mining and utilization

2.2: Structure and work of Internet: Communication Protocols (TCP/IP, HTTP, FTP)

2.3: Web pages (HTML, VRML) - Role as interface between user and computer database

2.4: Websites offers bioinformatics activities - NCBL, EBI, KEGG, PDF, SRC Sanger Institute)

Practical I (50 Marks)

1. Computer background and familiarization of computer system
2. Installation of various programs and utilities
    a. Windows
    b. Linux
    c. MS OFFICE
3. Installation of Bioinformatics utilities
    a. Bioedit
    b. Spdb viewer
    c. VMD
4. Assessing Internet
5. Surfing World Wide Web
6. Introduction to E. Note for electronic recording of scientific dark and its sharing.
7. Prepare MS Word, Excel and PowerPoint presentation

Practical II (50 Marks)

1. Introduction to biological database visiting
    1.1. NCBI,
    1.2: EBI,
    1.3: KEGG
    1.4: DDBJ
2. Bio edit exercises using sequences in animals
3. Prepare power point presentation for Biological databases
4. Use of molecular modeling software
5. Visualization of various structural features of the protein molecules.
6. Project – based on Biological databases

Books and References:

1. Bioinformatics: Methods and Protocols *Author(s): Stephen Misener (Editor), Stephen A. Krawetz (Editor)*
2. Bioinformatics: Databases and Algorithms,by N.Gautham, Alpha Science Intl Ltd; 1 edition
3. Bioinformatics for Beginners: Genes, Genomes, Molecular Evolution, Databases and Analytical Tools 1st Edition by Supratim Choudhari, Publisher: Academic Press; 1 edition
4. Bioinformatics and Molecular Evolution 1st Edition by Paul G. Higgs , Teresa K. Attwood Publisher: Wiley-Blackwell; 1 edition (February 11, 2005)
5. Fundamentals of Computers Sixth Edition by V. Rajaraman, Neeharika Adabala Publisher PHI learning private limited.
6. Bioinformatics – A Beginner's Guide by Jean –Michel Claverie, WILEY Publishing, Inc.
7. Introduction to Bioinformatics **by** Aurthur Lesk
8. Fundamental Genetics by John Ringo Cambridge University Press

Evaluation System:

Sr. No	Exam No.	Name of the Students	Theory		Practical	Project/ Industrual Visit /case study	Total Mark	Percentage %	Credits	SGPA
			Paper -I	Paper -II						
		Maximum Marks	50	50	50	50	200		04	
		Minimum Marks	20	20	20	20				

Credit Earned:. Grade: …….. Remarks:…….

Standard of Passing: 40%

Separate head of passing-Theory, Practical's, Project / Industrial Visit/Case study

Grading System:

A Grade	Above 75%
B Grade	60-74%
C Grade	40-59%

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Program: Certificate course

Revised Syllabus of Vermicomposting Technology

Choice Based Credit & Grading System (60:40)

w.e.f. Academic Year 2019-20

Certificate Course in Vermicomposting Technology

Introduction

Using worms to convert decomposing food waste into nutrient-rich fertilizer is simple, inexpensive, energy efficient, and a great way to teach students to become life-long recyclers. Vermicomposting technology is known throughout the world, albeit in limited areas. It may be considered a widely spread, though not necessarily popular technology. As a process for handling organic residuals, it represents an alternative approach in waste management, in as much as the material is neither land filled nor burned but is considered a resource that may be recycled. In this sense, vermicomposting is compatible with sound environmental principles that value conservation of resources and sustainable practices. Vermicomposting is however faster, produces fewer odors and produces a superior product. But vermicomposting requires greater surface area, more moisture, and is susceptible to heat, high salt levels, high ammonia levels, and substances that may be toxic to earthworms. Of the 4400 identified earthworm species, specific species of litter dwelling earthworms are required for this purpose. Vermicomposting in developing countries could prove to be useful in many instances. Where accumulation of food wastes, paper, cardboard, agriculture waste, manures and biosolids is problematic, composting and vermicomposting offer potential to turn waste material into a valuable soil amendment. In the past ten years an organization in India has promoted over 3,000 farmers and institutions to switch from conventional chemicals to the organic fertilizer, vermicompost.

Aims:

- Students will be able to compost in a limited space and describe the decomposing process.
- The interested students will get the knowledge of composting,
- Students will get the employment and they can generate employments.
- They will also turn towards organic farming,
- Will help to maintain the environment pollution free and will get the knowledge of biodiversity of local earthworms.

Focus- To convert unwanted, organic matter, particularly food scraps and paper into fertile soil.

Name of the course: Certificate Course in Vermicompost technology

- **Level:** Certificate
- **Stream:** Science
- **Subject:** Vermiculture/ vermicompost
- **Duration:** 3 months

Language: English

Fees: Rs.500/

Academic calendar for the course: Four days in a week (3days theory periods & 1day practical)

Available infrastructure: laboratory, vermiculture units

Course Content: Syllabus/Program:

SCHEME

Vermicompost technology as one of the Certificate Course at undergraduate level Credits to be earned :04

Credit can be earned	Credits	Hours
Theory	03	30
Practical	01	30
Project	01	15

Course Objectives:

1. Grasp the ecological and biological foundations of vermicomposting and its benefits for soil health and waste reduction.
2. Recognize and select suitable earthworm species for vermicomposting based on their behaviours and characteristics.
3. Set up and manage different types of vermicomposting systems, such as bins, pits, and windrows, considering space and resource availability.
4. Manage Worm Population: Understand the factors influencing worm population growth, reproduction, and health, and implement strategies for their optimal management.

Course Outcomes:

Upon successful completion of the course, participants will be able to:

- Independently establish and manage a vermicomposting system based on the chosen method and available resources.
- Implement strategies to ensure the well-being and reproductive success of the worm population.
- Apply Vermicompost to Soil: Effectively apply vermicompost to improve soil structure, fertility, water retention, and plant nutrient uptake.
- Understand the eco-friendly aspects of vermicomposting and contribute to reducing organic waste sent to landfills.

Title of the Course: Certificate Course in Vermicompost technology

Course code: USCCVER

Theory Course – Vermicompost Technology -01

Course outcome:

- *The learners will produce good quality of Vermicompost and Vermiculture.*
- *Acquire skills for entrepreneurship.*

Theory (3 Credits)

Sr. no	Unit-I General Vermiculture/ Vermicompost	10 Hrs
1.	Introduction to vermiculture- Definition, terminology and historical review	
2.	Economic important values in maintenance of soil structure and its role.	
3.	Responsibility in bio transformation of the residues generated by human activity and production of organic fertilizers.	
4.	Transformation process in organic matter.	
5.	Choosing the right worm. Useful species of earthworms. Local species of earthworms. Exotic species of earthworms.	
	Unit-II Earthworm Biology and Rearing	**10 Hrs**
6.	Key to identify the species of earthworms.	
7.	Biology of *Eisenia fetida*. a) Taxonomy Anatomy, physiology and reproduction of Lumbricidae. b) Vital cycle of Eisenia fetida: alimentation, fecundity, annual reproducer potential and limit factors (gases, diet, humidity, temperature, PH, light, and climatic factors). Complementary activities of auto evaluation.	
	Biology of *Eudrilus eugeniae*. c) Taxonomy Anatomy, physiology and reproduction of Eudrilidae. d) Vital cycle of Eudrilus eugeniae: alimentation, fecundity, annual reproducer potential and limit factors (gases, diet, humidity, temperature, PH, light, and climatic factors).	

	Complementary activities of auto evaluation.	
	Unit-III Vermicompost Technology (Methods and Products)	**15 Hrs**
1.	Small Scale Earthworm farming for home gardens - Earthworm compost for home gardens	
2.	Conventional commercial composting - Earthworm Composting larger scale	
3.	Earthworm Farming (Vermiculture), Extraction (harvest), vermicomposting harvest and processing.	
4.	Nutritional Composition of Vermicompost for plants, comparison with other fertilizers	
5.	Vermiwash collection, composition &use	
6.	Frequent problems faced in process of vermicompost Technology.	
	Unit-IV Applied vermiculture.	**15Hrs**
1.	a) The working group experience with E. fetida populations comportment with farm industrial residues b) Distinguishing features of vermicomposting elaboration projects.	
2.	c) Economical aspects of this activity. d) Research and ratability according to different exploitation orientations. e) Toxins released by the worms (harmful effects)	

Practical Course – Vermicompost Technology -02

Practical **1 Credit**

	Unit-V	**30Hrs**
1	Key to identify different types of earthworms.	
2	Field trip- Collection of native earthworms & their identification.	
3	Study of Sytematic position, habits, habitat & External characters of Eisenia fetida.	
4	Study of Life stages & development of Eisenia fetida.	
5	Study of Life stages & development of Eudrilus eugeniae.	
6	Comparison of morphology & life stages of Eisenia fetida & Eudrilus eugeniae.	
7	Study of Vermiculture, Vermiwash & Vermicompost equipments, devices.	
8	Preparation vermibeds, maintenance of vermicompost & climatic conditions.	
9	Harvesting, packaging, transport and storage of Vermicompost and separation of life stages.	
10	Study the effects of vermicompost & vermiwash on any two short duration crop plants.	
11	Study the effects of sewage water on development of worms.	

Project work – 01 Credit

1	**Based on Vermicomposting Technology**	**20Hrs**

Total periods in hrs = 100 hrs.

Theory 15/10 hrs per unit x 4 units = 50 hrs + 30 hrs for practical + 20 hrs Project.

Initially about 60days are required to set the culture or to form the vermicompost, latter on in about 45 days second culture will be formed. Students will observe 2 succeeding beds (rearing).

Examination structure & schedule: At the end of course, the examination will be conducted. Its notice & time table will be displayed for communication to the students at least before 15 days of the date of examination.

1. Course 01- Theory paper (objective/short answer type) = 50 marks,
2. Course 02- Practical paper = 30 marks + 20 marks project

Marking scheme & Award of grades:

- **i.** 8-10 marks = 1point, C' grade – pass;
- **ii.** 10-20 marks = 2 points, B' grade;
- **iii.** 20-30 marks = 3points, B+ grade;
- **iv.** 30-40 marks = 4points, A' grade;
- **v.** 40-50 marks = 5points, A+ grade

Award of Certificate carrying grades: after successful completion of course indicating grade will be awarded to the candidate.

Advantage of the Course & Future Prospects:

- **I.** Students can construct their own compost farm & thereby can get monthly income of Rs. 7000-8000.
- **II.** Students/ farmers by using vermicompost in their field can increase the crop yield.
- **III.** Students residing in cities can produce vermicompost in small scale for garden/household plants.
- **IV.** They can get the jobs in educational institutes as vermicompost/vermiculture technician.
- **V.** The candidate can generate income by supplying worms, vermiwash, & vermicompost.
- **VI.** It will lead towards organic farming & healthy food.
- **VII.** In today's world, recycling of garbage has become necessary in order to sustain our health and environment. So, let's join for Four R's of Recycling Reduce, Reuse, Recycle, Restore i.e. certificate course in vermicompost technology.

Reference books

1. Bhatt J.V. & S.R. Khambata (1959) “Role of Earthworms in Agriculture” Indian Council of Agricultural Research, New Delhi.
2. Dash, M.C., B.K.Senapati, P.C. Mishra (1980) “ Verms and Vermicomposting” Proceedings of the National Seminar on Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, Jyoti Vihar, Orissa.
3. Edwards, C.A. and J.R. Lofty (1977) “Biology of Earthworms” Chapman and Hall Ltd., London.
4. Lee, K.E. (1985) “Earthworms: Their ecology and Relationship with Soils and Land Use” Academic Press, Sydney.
5. Kevin, A and K.E.Lee (1989) “ Earthworm for Gardeners and Fisherman” (CSIRO, Australia, Division of Soils)
6. Rahudakar V.B. (2004). Gandul khatashivay Naisargeek Paryay, Atul Book Agency, Pune.
7. Satchel, J.E. (1983) “Earthworm Ecology” Chapman Hall, London.
8. Wallwork, J.A. (1983) “Earthworm Biology” Edward Arnold (Publishers) Ltd. London.