

॥ सा विद्या या विमुक्तये ॥



स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

“ज्ञानतीर्थ” परिसर, विष्णुपुरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

“Dnyanteerth”, Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१-२२ पासून लागू करण्याबाबत.

परिपत्रक

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्याशाखेने दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व दिनांक १२ जून २०२१ रोजी संपन्न झालेल्या ५१ व्या मा. विद्या परिषद बैठकीतील विषय क्र. २६/५१-२०२१च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे खालील विषयांचे C.B.C.S. (Choice Based Credit System) Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१-२२ पासून लागू करण्यात येत आहेत.

1. B.Sc.-III Year-Biophysics
2. B.Sc.-III Year-Bioinformatics
3. B.Sc.-III Year-Biotechnology
4. B.Sc.-III Year-Biotechnology (Vocational)
5. B.Sc.-III Year-Botany
6. B.Sc.-III Year-Horticulture
7. B.Sc.-III Year-Agro Chemical Fertilizers
8. B.Sc.-III Year-Analytical Chemistry
9. B.Sc.-III Year-Biochemistry
10. B.Sc.-III Year-Chemistry
11. B.Sc.-III Year-Dyes & Drugs Chemistry
12. B.Sc.-III Year-Industrial Chemistry
13. B.C.A. (Bachelor of Computer Application)-III Year
14. B.I.T. (Bachelor of Information Technology)-III Year
15. B.Sc.-III Year-Computer Science
16. B.Sc.-III Year-Network Technology
17. B.Sc.-III Year-Computer Application (Optional)
18. B.Sc.-III Year-Computer Science (Optional)
19. B.Sc.-III Year-Information Technology (Optional)
20. B.Sc.-III Year-Software Engineering
21. B.Sc.-III Year-Dairy Science
22. B.Sc.-III Year-Electronics
23. B.Sc.-III Year-Environmental Science
24. B.Sc.-III Year-Fishery Science
25. B.Sc.-III Year-Geology
26. B. A./B.Sc.-III Year-Mathematics
27. B.Sc.-III Year-Microbiology
28. B.Sc.-III year Agricultural Microbiology
29. B.Sc.-III Year-Physics
30. B. A./B.Sc.-III Year Statistics
31. B.Sc.-III Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या www.srtmun.ac.in या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

‘ज्ञानतीर्थ’ परिसर,

विष्णुपुरी, नांदेड - ४३१ ६०६.

जा.क्र.: शैक्षणिक-१/परिपत्रक/पदवी-सीबीसीएस अभ्यासक्रम/
२०२१-२२/७५

दिनांक : १२.०७.२०२१.

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- २) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
- ४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
- ५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
- ६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
- ७) अधीक्षक, परीक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

स्वाक्षरित

सहा.कुलसचिव

शैक्षणिक (१-अभ्यासमंडळ) विभाग

Swami Ramanand Teerth Marathwada University, Nanded.

FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc. (Biotechnology) Vocational Third Year (CBCS Pattern)

Semester	Course No.	Name of the Course	Instruction Hrs/ week	Total period	Internal Evaluation	Marks of Semester	Total Marks	Credits
V	DECBT I (Section A)	Plant Tissue Culture (P-XII)	03	45	10	40	50	2
	DECBT I [(Section B) Elective]	Environmental Biotechnology (P-XIII)	03	45	10	40	50	2
	DECBT I [(Section A)]	Practical's based on P- XII & PXIV(P-XVI)	04	10 Practical	10	40	50	2
		SEC III A (Plant Micropropagation Techniques) Or SECIII B (Environmental Contamination & Abatement)			25	25	50	(2)*
VI	DECBT II (Section A)	Plant transformation technology (P-XIV)	03	45	10	40	50	2
	DECBT II [(Section B) Elective]	Industrial Bio technology (P-XV)	03	45	10	40	50	2
	DECBT II [(Section B)]	Practical's based on P- XIII & P- XV (P- XVII)	04	10 Practical	10	40	50	2
		SEC IV A (Plant Tissue culture technology) Or SEC IV B (Fermentation technology)			25	25	50	(2)*
Total credits semester V and VI								12(04)*

Swami Ramanand Teerth Marathwada University, Nanded
Choice Base Credit System (CBCS) Pattern
B.Sc Third Year (Semester V)
Semester Pattern effective from June 2018
Biotechnology (Vocational) DECBT I (Section A)
Plant Tissue Culture (Paper XII)

Maximum Marks: 50

Periods: 45

Learning objectives

1. To understand techniques of plant tissue culture
2. To understand techniques of applications of plant tissue culture

Learning outcome

1. To learn different techniques plant tissue culture
2. To learn concept of Haploid production, micro propagation, Embryo culture

Unit-I (13 Periods)

Introduction to *in vitro* methods. History of tissue culture Techniques. Beginning of *in vitro* cultures in our country Terms and definitions. Concept of Totipotency. Sterilization techniques. Types of nutrient medium. Callus and Suspension cultures. Shoot Regeneration, Events during shoot regeneration, factors affecting shoot bud regeneration. Somatic embryogenesis. factors affecting somatic embryogenesis

Unit-II (12 periods)

Micro propagation. Introduction, meristem culture, stages of micro propagation, nutrient media and culture environment for culture initiation and shoot multiplication, Applications of micro propagation, advantages of micro propagation.

Production of virus free plants. Shoot meristem culture.

Germplasm conservation. Introduction and importance of germplasm conservation. Improved methods of cryopreservation,

Unit-III (10Periods)

Haploid production. Introduction, Definitions, Androgenesis, pathways of early development, pollen dimorphism, factors affecting Androgenesis, Pollen culture.

Gynogenesis, haploid plants from interspecific crosses. Applications of Haploids. Embryo culture, preparation of embryos for culture, Applications of embryo culture. Embryo Rescue.

Unit-IV (10 Periods)

Somatic Hybridization. Introduction Protoplast isolation. Enzyme activities, plant tissues, protoplast Purification, protoplast culture, Protoplast fusion.

Selection of Hybrid cells. Visual markers, fluorescent dyes, complementation, transgenic selectable markers, culture of Entire Fusion mixture.

Applications in crop improvement.

Text & References:

1. Elements of Biotechnology. P.K. Gupta
2. Plant biotechnology - B.D.Singh
3. An introduction to Plant biotechnology –H.S. Chawla.
4. An introduction to Plant tissue culture – A.K.Razdhan
5. Biotechnology - B.D.Singh
6. Introduction to plant tissue culture – M.K. Razdan
7. Plant tissue culture : Theory and practice- S.S. Bhojawani and M.K.Razdan

B. Sc. THIRD YEAR BIOTECHNOLOGY (VOCATIONAL)

Choice Base Credit System (CBCS) Pattern

SEMESTER – V

DECBT I (Section B)

ENVIRONMENTAL BIOTECHNOLOGY (Paper XIII)

Maximum Marks – 50

Periods – 45

Learning objectives

1. To understand different biotechnological ways to reduce environmental problems
2. To understand problem of energy crisis and find a solution

Learning outcome

1. To learn ways to reduce environmental pollution
2. To learn to utilize biomass for obtaining fuel

Unit-I (10Periods)

Environment Basic concepts & issues Introduction to environmental biotechnology Physical environment, biotic environment Biotic and abiotic interactions. Environmental pollution; global environmental change, greenhouse effect, Ozone depletion, Ultraviolet Radiation, Acid Rain, Biotechnological approaches for management.

Unit-II (10Periods)

Biodegradation; Definition and Concept, Aerobic and anaerobic degradation pathways Biodegradation of Hydrocarbon with suitable example. Xenobiotic Degradation; Pesticide degradation-principle with suitable example Herbicide degradation- principle with suitable example

Unit-III (13Periods)

Bioremediation; Definition, and concept, methods of bioremediation (Insitu and Exsitu methods. Applications of bioremediation Phytoremediation ; Definition ,concept and types

Unit-IV (12Periods)

Biofuel and biodiesel Biabsorption technology, Mushroom Production on agrowaste, Vermicomposting, GMF-advantages and disadvantages Biomass; Composition of biomass, types of biomass, biomass conversion

Text & References:

1. Biotechnology – B.D.Singh
2. Biotechnology – R. C Dubey
3. Ecology – Odum
4. Ecology and Environment - P.D Sharma
5. Environmental Biotechnology – Indu shekharThakur
6. Environmental Chemistry – A.K.De
7. Environmental Chemistry – B.K.Sharma
8. Introduction to Biodeterioration – D.Allsopp and seal
9. Waste water engineering – Metcalf and Eddy

B. Sc THIED YEAR BIOTECHNOLOGY (VOCATIONAL)
Choice Base Credit System (CBCS) Pattern
SEMESTER – VI
DECBT II (Section A)
PLANT TRANSFORMATION TECHNOLOGY (Paper XIV)

Maximum Marks –50

Periods – 45

Learning objectives

- 1.To understand plant mediated transformation techniques
- 2.To understand techniques to produce plants with desirable traits

Learning outcome

1. To different gene transfer techniques in plants
2. To learn techniques to produce Insect resistant plants, produce secondary metabolites from plants

Unit-I (10Periods)

Introduction to transgenic plants. Advantages and Disadvantages.

Applications of transgenic plants. Gene constructs. A typical plant gene, promoters/enhancers Reporter genes, selectable markers, scorable markers, problems imposed by antibiotic resistance genes

Unit-II (10 Periods)

Vectors for the production of transgenic plants.

Plant virus vectors. Cauliflower mosaic virus, Gemini viruses, Tobacco mosaic virus, brome mosaic virus. Plasmid vectors. Introduction to *A.tumefaciens*. Tumor formation on plants using *A.tumefaciens* (monocots Vs Dicots). Root - formation using *A.rhizogenes*. Practical application of genetic transformation. Basis of tumor formation, hairy root, features of Ri & Ti plasmids.

Unit-III (13 Periods)

Mechanism of DNA transfer, role of virulence genes, use of Ti & Ri as vectors

Binary vectors, use of reporter genes, methods of nuclear transformation, viral vectors and their applications.

Multiple gene transfers vector less or direct gene transfer, particle bombardment, Electroporation, microinjection, transformation of monocots.

Unit-IV (12 Periods)

Plant transgene action.

Herbicide resistance. Glyphosate action, strategies for glyphosate action.

Insect resistance The crystal proteins, Toxic action of crystal proteins, expression of crystal proteins in plants.

Virus resistance,. Virus coat protein gene, cDNA of satellite RNA, defective viral genomes, Antisense RNA approach, Ribozyme mediated protection.

Drought resistance, pest resistance, long shelf life of fruits and flowers. Chloroplast transformation, advantages.

Plant secondary metabolites, industrial enzymes, biodegradable plastic, poly hydroxyl butyrate, edible vaccines.

Text & References:

1. Biotechnology - B.D.Singh
2. Plant Biotechnology – B.D.Singh
3. Biotechnology – P.K.Gupta
4. Introduction to plant tissue culture – M.K. Razdan
5. Plant tissue culture: Theory and practice- S.S. Bhojawani and M.K.Razdan

B. Sc. THIRD YEAR BIOTECHNOLOGY (VOCATIONAL)
Choice Base Credit System (CBCS) Pattern
SEMESTER – VI
DECBT II (Section B)
INDUSTRIAL BIOTECHNOLOGY (Paper XV)

Maximum Marks – 50

Periods – 45

Learning objectives

- 1.To understand applications of microbes in industry
- 2.To understand different fermentation techniques

Learning outcome

1. To learn design types and working of fermenter
2. To learn downstream techniques and methods for production of microbial metabolites

Learning outcome

Unit-I (10 Periods)

Introduction to Fermentation: Introduction, Fermentation and Components of Fermentation, Types of Fermentation

Screening: Definition and Objectives, Strain Improvement, Inoculum Development

UNIT II (10 periods)

Media Constituents: Carbon Source , Nitrogen Source,minerals, buffers, growth factors, antifoams agents and Medium Optimization

Media Sterilization, batch and continuous

Unit-III (12 Periods)

Downstream Processing: Precipitation, Filtration , Centrifugation, Cell Disruption, Liquid –Liquid Extraction, Chromatography, Membrane Separation Processes, Drying, Whole Broth Processing

Unit-IV (13 Periods)

Fermentation Products, Solvent- Alcohol, Enzyme- Amylases, Antibiotics- Streptomycin, Amino Acids- Glutamic acid, Organic acid- Citric Acid.

Text & References:

1. Principles of Fermentation Technology - Whittaker & Stanberry- Elsevier
2. Process Biotechnology Fundamentals-Mukopadhaya- Viva
3. Casida L.E - Industrial Microbiology- New Age
4. Crueger W and Crueger A - Biotechnology: A Textbook of Industrial Microbiology-Panima Publishing
5. Patel A.H. - Industrial Microbiology, Macmillan India
6. Peppler H.J and Perlman D - Microbial Technology, Vol I and II-Elsevier
7. Prescott and Dunn's- Industrial Microbiology-CBS
8. Large Scale Manufacturing Process, Reymendencily G. Martin, Vision publications, Pune
9. Basic Industrial Biotechnology SM Reddy S Ram Reddy, G Narendra Babu, New Age International (P) Ltd

B.Sc. THIRD YEAR, BIOTECHNOLOGY (VOCATIONAL)
Choice Base Credit System (CBCS) Pattern
DECBT – I (Section A)
PRACTICALS BASED ON THEORY PAPERS OF
(DECBT I & DECBT II) (Section A)
P-XVI

Plant tissue culture & Plant transformation technology

Practical –10

Maximum Marks – 50

Practical 1 : Equipments and other requirements in plant tissue culture laboratory.

Practical 2 : preparation of MS & white's media, root & shoot induction media, embryo culture media.

Practical 3 : sterilization of explants, Initiation of callus.

Practical 4 : organogenesis of cultured leaf disc of banana.

Practical 5 : Tissue culture of cereals

Practical 6 : : Plant Transformation

Practical 7 :. preparation of competent cells

Practical 8 : Agarose gel electrophoresis.

Practical 9 :. cytological examination of regenerated plants

Practical 10. *Agrobacterium* culture & selection of transformants

Practical 11 : Visit to tissue culture laboratory

B.Sc. THIRD YEAR, BIOTECHNOLOGY (VOCATIONAL)
Choice Base Credit System (CBCS) Pattern
DECBT- II (Section B)
PRACTICALS BASED ON THEORY PAPERS OF
(DECBT I & DECBT II) (Section B)
P-XVII

Environment Biotechnology & Industrial Bio technology

Practical – 17

Maximum Marks – 50

Practical 1 : isolation of hydrocarbon degraders.

Practical 2 : isolation of pesticide/ herbicide hydrocarbon degraders

Practical 3 : Test for the degradation of aromatic Hydrocarbons bacteria.

Practical 4 : Biological oxygen demand and Chemical oxygen demand

Practical 5 : isolation of cellulose/ pectin/ starch degraders

Practical 6 : . Isolation and Screening of Industrially important Microbes-Acid, Antibiotics, Enzymes

Practical 7 : Study of Strain improvement

Practical 8 : Fermentative production purification and estimation of Citric Acid

Practical 9 : Fermentative production purification and Estimation of alcohol. using *Sacharomyces cerevisiae*

Practical 10 : Study of any two Downstream Processing methods

Practical 11 :. Visit to Fermentation Industry

Swami Ramanand Teerth Marathwada University, Nanded
Choice Base Credit System (CBCS) Pattern
B.Sc Third Year Biotechnology (Vocational) Semester V
SEC IIIA Plant Micropropagation Techniques

Learning objectives

- 1.To learn callus culture
- 1.To learn embryo culture
- 1.To learn anther culture

Learning outcome

1. To learn to prepare plant tissue culture media
2. To will learn to prepare synthetic embryo

Unit I

Plant Micro-propagation. Introduction and objectives

Practical

1. Introduction to plant tissue culture lab
2. Root Media preparation
3. Shoot Media preparation

Unit II-

Introduction to callus and callus culture, advantages

Practical

1. Explant sterilization
2. Callus Induction

Unit III

Embryo culture –advantages and disadvantages

Practical

1. Preparation of synthetic embryo
2. Embryo culture medium preparation
3. Embryo induction

Unit IV

Haploid production –advantages and disadvantages

Practicals

1. Pollen culture
2. Anther culture

References ;

1. Principles of Biochemistry - Lehninger , Nelson, Cox, CBS publishers
2. Biochemistry- U Satyanarayana
3. Biochemistry- J.L Jain, S. Chand Publication
4. Advanced biotechnology – R.C Dubey, S. Chand Publication

Swami Ramanand Teerth Marathwada University, Nanded
B.Sc Third Year Biotechnology (Vocational) Semester V
Choice Base Credit System (CBCS) Pattern
SEC III B Environmental Contamination & Abatement

Learning objectives

1. To understand different biotechnological ways to reduce environmental problems
2. To understand problem of energy crisis and find a solution

Learning outcome

1. To learn ways to reduce environmental pollution
2. To learn to utilize biomass for obtaining fuel

Unit - I

Types of pollutions; Air ,Water and Soil causes and its effects

Practicals :

1. Microbial examination of water.
2. Determination of TS, TSS and TDS of drinking water.

Unit - II

Methods for the measurement of pollution.
Biotechnological approaches for the control of pollution.

Practicals :

1. Chemical analysis of soil.
2. Isolation of heavy metal degrading bacteria from soil.

Unit – III

Microorganisms involved in bioremediation
Monitoring of bioremediation.
Superbug for bioremediation.

Practicals :

1. Isolation of hydrocarbon degraders from soil.
2. Isolation of plasmid from hydrocarbon degrader.

Unit –IV

Introduction, Definition, classification & Sources of Biomedical waste.
Biomedical waste management process.

Practicals :

1. Collection of Biomedical waste
2. Disposal of Biomedical waste by physical chemical & Biological methods.

References;

1. Environmental Biotechnology Indushekhar Thakur- I K International
2. Text book of Environmental Biotechnology P. Mohapatra- I K International
3. Environmental Biotechnology by Alan Scragg. Pearson Education Limited.
4. Advanced biotechnology – R.C Dubey, S. Chand Publication

Swami Ramanand Teerth Marathwada University, Nanded
Choice Base Credit System (CBCS) Pattern
B.Sc Third Year Biotechnology (Vocational) Semester VI
SEC IVA Plant Tissue culture Technology

Learning objectives

- 1.To learn set up of plant tissue culture laboratory
- 2.To learn micropropagation

Learning outcome

1. To learn to prepare plant tissue culture media
2. To learn micropropagation techniques

Unit I

Structural Layout of Plant Tissue Culture Laboratory, Sterilization techniques, Culture Medium and its components and applications of PTC.

Practicals

- 1) Sterilization techniques.
- 2) Preparation of stock solutions and MS medium.

Unit II

Micropropagation:-Defination,Importance and Micropropagation phases (Selection and maintenance, Initiation, Multiplication (Subculture), Rooting and Hardening (Primary & Secondary)

Practicals

- 1) Surface sterilization of explants
- 2) Callus culture

Unit III

Banana Micropropagation:-Introduction,Micropropagation phases (Selection and maintenance,Initiation,Multiplication(Subculture),Rooting and Hardening (Primary & Secondary)

Practicals

- 1) Micropropagation of Banana

Unit IV

Gerbera Micropropagation:-Introduction,Micropropagation phases (Selection and maintenance,Initiation,Multiplication(Subculture),Rooting and Hardening (Primary & Secondary).

Practicals

- 1) Micropropagation of Gerbera

Text and references

- 1) Plant Tissue Culture :- Bhojwani and Razdan
- 2) Methods in Plant Tissue Culture :- U kumar
- 3) Plant Cell and Tissue culture:-A Tool in Biotechnology-Karl-Hermann

Swami Ramanand Teerth Marathwada University, Nanded
Choice Base Credit System (CBCS) Pattern
B.Sc Third Year Biotechnology (Vocational) Semester VI
SEC IV B: Fermentation technology

Learning objectives

- 1.To understand applications of microbes in industry
- 2.To understand isolation and screening techniques

Learning outcome

1. To learn design types fermentation processes
2. To learn downstream techniques
3. To learn downstream techniques of enzyme and antibiotic production

Unit I

Isolation and screening-types of screening

Practical

1. Isolation of Industrially important micro-organism
2. Identification and characterization of Micro-organism
3. Screening of antibiotic , acid producers

Unit II

Downstream processing-Filtration centrifugation, chromatography

Practical

1. Chromatography
2. Removal of microbial cells by filtration,centrifugation

Unit III

Types of fermentation processes –submerged, SSF

Practical

1. Alcohol production
2. Citric acid production

Unit IV

Enzyme production and purification -Amylase
Antibiotic production -Penicillin

Practical

1. Amylase production
2. Penicillin production

References:

1. Textbook of Biotechnology : R C Dubey (S. Chand Publication)
2. Biofertilizer Technology: Singh and Purohit (Agrobiouse Publication)