

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

B.Sc. GENERAL (SEMESTER PATTERN)

B.Sc. THIRD YEAR

BIOTECHNOLOGY (VOCATIONAL) - CURRICULUM

With Effect from June - 2015

B. Sc. BIOTECHNOLOGY (VOCATIONAL) CURRICULUM
(SEMESTER PATTERN)

Class	Paper No. Code no.	Title of Paper	Periods/ Practical's	Time duration of Examination	Maximum Marks
B.Sc.IIlyr Semester-V	Paper -I VBT- 1.12	Plant tissue culture	45	3 Hrs.	40+10*
	Paper -II VBT-1.13	Environmental Biotechnology	45	3 Hrs.	40+10*
B.Sc.IIlyr Semester-VI	Paper -III VBT-1.14	Plant transgenesis	45	3 Hrs.	40+10*
	Paper -IV VBT-1.15	Bioresource Technology	45	3 Hrs.	40+10*
B.Sc.IIlyr	VBP-XVI (Practical) Annual pattern	Practical Based On Theory Papers Of VBT-1.12 & VBT-1.14	15	4 Hrs. for two consecutive days	50
B.Sc.IIlyr	VBP-XVII (Practical) Annual pattern	Practical Based On Theory Papers Of VBT-1.13 & VBT-1.15	15	4 Hrs. for two consecutive days	50

* Internal marks

Workload:

1. **Theory:** Per paper per week three periods
2. **Practical:** Per batch per week two practical (Three periods)

B. Sc. THIRD YEAR BIOTECHNOLOGY (VOCATIONAL)
SEMESTER – V
THEORY PAPER I
VBT- 1.12 (PLANT TISSUE CULTURE)

Periods – 45

Maximum Marks – 50

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)
SEMESTER – V
THEORY PAPER II
VBT- 1.13 (ENVIRONMENTAL BIOTECHNOLOGY)**

Periods – 45

Maximum Marks – 50

Unit-I (10Periods)

Environment Basic concepts & issues
Introduction to environmental biotechnology
Physical environment, biotic environment
Biotic and abiotic interactions.

Unit-II (10Periods)

Concept of habitat and Niche
Nature of communities, Ecological succession
Renewable and non-renewable resources.
Biodiversity; status monitoring and documentation.

Unit-III (13Periods)

Modern fuels and their environmental impacts: Methanogenic bacteria and biogas production, Conversion of sugars to ethanol. The gasohol experiment.
Environmental pollution; global environmental change, greenhouse effect, Ozone depletion, Ultraviolet Radiation, Acid Rain, Biotechnological approaches for management.

Unit-IV (12Periods)

Principles of conservation, major approaches to management
Concept of Biofertilizers (Rhizobium and Azatobactor)
Treatment of municipal waste and industrial effluents.
Solid waste : sources & Management (Composting, Vermiculture).

Text & References:

- 1.Environmental Biotechnology – Indu shekharThakur
2. Environmental Chemistry – B.K.Sharma
3. Biotechnology – B.D.Singh
4. Waste water engineering – Metcalf and Eddy
5. Ecology and Environment - P.D Sharma
- 6.Ecology - Odum

B. Sc THIED YEAR BIOTECHNOLOGY (VOCATIONAL)
SEMESTER – VI
THEORY PAPER III
VBT- 1.14 (PLANT TRANSGENESIS)

Periods – 45

Maximum Marks – 50

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)
SEMESTER – VI
THEORY PAPER IV
VBT- 1.15 (BIORESOURCE TECHNOLOGY)

Periods – 45

Maximum Marks – 50

Unit-I (10 Periods)

Biodegradation; Definition and Concept,
Aerobic and anaerobic degradation pathways
Biodegradation of Hydrocarbon with suitable example.

UNIT II (10 periods)

Xenobiotic Degradation; Pesticide degradation-principle with suitable example
Herbicide degradation- principle with suitable example
Biopesticides , *Thuringiensis* toxin as a natural pesticides. Biological control of other insects swarming the agricultural fields..

Unit-III (12 Periods)

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

Unit-IV (13 Periods)

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. Environmental Biotechnology – Indu shekharThakur
2. Environmental Chemistry – B.K.Sharma
3. Biotechnology – B.D.Singh
4. Environmental Chemistry – A.K.De
5. Introduction to Biodeterioration – D.Allsopp and seal
6. Biotechnology – R. C Dubey

**B.Sc. THIRD YEAR, BIOTECHNOLOGY (VOCATIONAL)
PRACTICAL PAPER – III (Annual)
BASED ON THEORY PAPERS OF BTT-1.12 & BTT-1.14**

Practical –17

Maximum Marks – 100

Plant tissue culture & Plant transgenesis

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

Practical 2 : preparation of MS & white's media.

Practical 3 : preparation of root & shoot induction media.

Practical 4 : preparation sugarcane tissue culture media.

Practical 5 : preparation of embryo culture media.

Practical 6 : sterilization of explants.

Practical 7 : Initiation of callus.

Practical 8 : organogenesis of cultured leaf disc of banana.

Practical 9 :Tissue culture of cereals.

Practical 10 : Embryo culture of papaya.

Practical 11 : Preparation of synthetic seeds.

Practical 12 : Isolation of Plasmid

Practical 13 : Plant Transformation

Practical 14 : preparation of competent cells

Practical 15 : Agarose gel electrophoresis.

Practical 16 :cytological examination of regenerated plants

Practical 17 : *Agrobacterium* culture & selection of transformants

**B.Sc. THIRD YEAR, BIOTECHNOLOGY (VOCATIONAL)
PRACTICAL PAPER – III (Annual)
BASED ON THEORY PAPERS OF BTT-1.13 & BTT-1.15**

Practical – 15

Maximum Marks – 100

Environment biotechnology & Bioresource technology

Practical 1 : Estimation of calcium content of water sample.

Practical 2 : Estimation of mg^{++} ions in water.

Practical 3 : Enrichment & isolation of hydrocarbon degraders.

Practical 4 : Walkey & Blakey modified method for estimation of organic matter.

Practical 5 : Biological oxygen demand.

Practical 6 : Chemical oxygen demand

Practical 7 : Estimation of Nitrate in drinking water

Practical 8 : Determination of chlorides in water

Practical 9 : Test for the degradation of aromatic Hydrocarbons bacteria.

Practical 10 : Estimation of amount of Co_2 present in water.

Practical 11 : Estimation of dissolved oxygen.

Practical 12 : Qualitative analysis of water(MPN).

Practical 13 : Total alkality of water sample.

Practical 14 : Estimation of amount of acidity.

Practical 15 : Hardness of water sample by EDTA method.

Practical 16 : Isolation of Rhizobium and Azatobactor spp.

Practical 17 : Production of Biofertilizers (Rhizobium and Azatobactor)

SKELETON OF QUESTION PAPER**B.Sc. THIRD YEAR BIOTECHNOLOGY (VOCATIONAL)****SEMESTER-V****THEORY PAPER – I / II****VBT- 1.12 (PLANT TISSUE CULTURE) /****VBT- 1.13 (ENVIRONMENTAL BIOTECHNOLOGY)****Time:** *Three hours***Maximum Marks:** *50*

- Note: -**
- (i) Attempt all questions
 - (ii) All questions carry equal marks
 - (iii) Draw neat and well labeled diagrams wherever necessary
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VBT- 1.12 PLANT TISSUE CULTURE

Q.1.	Short answer type (5X1)	05
Q.2.	Long Answer type (5X2)	10
Q.3.	Long Answer type (10X1)	10
Q.4	Multiple Choice Questions	15
	• Internal marks	10 marks

VBT- 1.13 ENVIRONMENTAL BIOTECHNOLOGY

Q.1.	Short answer type (5X1)	05
Q.2.	Long Answer type (5X2)	10
Q.3.	Long Answer type (10X1)	10
Q.4	Multiple Choice Questions	15
	*Internal marks	10 marks

SKELETON OF QUESTION PAPER**B.Sc. THIRD YEAR BIOTECHNOLOGY (VOCATIONAL)****SEMESTER- VI****THEORY PAPER – III /IV****VBT- 1.14 (PLANT TRANSGENESIS) /****VBT- 1.15 (BIORESOURCE TECHNOLOGY)****Time:** *Three hours***Maximum Marks:** *50*

- Note: -**
- (i) Attempt all questions
 - (ii) All questions carry equal marks
 - (iii) Draw neat and well labeled diagrams wherever necessary

VBT- 1.14 PLANT TRANSGENESIS

Q.1.	Short answer type (5X1)	05
Q.2.	Long Answer type (5X2)	10
Q.3.	Long Answer type (10X1)	10
Q.4	Multiple Choice Questions	15
	• Internal marks	10 marks

VBT- 1.15 BIORESOURCE TECHNOLOGY

Q.1.	Short answer type (5X1)	05
Q.2.	Long Answer type (5X2)	10
Q.3.	Long Answer type (10X1)	10
Q.4	Multiple Choice Questions	15
	*Internal marks	10 marks

PROFORMA FOR PRACTICAL EXAMINATION
SWAMI RAMANAND TREETH MARATHWADA UNIVERSITY, NANDED
Faculty of Science
B. Sc. III year Vocational Biotechnology
Practical Examination
VBP- XVI

Time: 9.00 am to 1.00 pm (for two consecutive days)	Marks: 50
Q 1) Major Question (Plant tissue culture)	10
Q 2) Major Question (Plant tissue culture)	10
Q 3) Major Question (Plant transgenesis)	10
Q 4) Major Question (Plant transgenesis)	10
Q 5) Viva-Voce	05
Q 6) Record Book	05

PROFORMA FOR PRACTICAL EXAMINATION
SWAMI RAMANAND TREETH MARATHWADA UNIVERSITY, NANDED
Faculty of Science
B. Sc. III year Vocational Biotechnology
Practical Examination
VBP- XVII

Time: 2.00 pm to 6.00 pm (for two consecutive days)	Marks: 50
Q 1) Major Question (Environmental Biotechnology)	10
Q 2) Major Question (Environmental Biotechnology)	10
Q 3) Major Question (Bioresource technology)	10
Q 4) Major Question (Bioresource technology)	10
Q 5) Viva-Voce	05
Q 6) Record Book	05