

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. GENERAL (SEMESTER PATTERN)**

**B.Sc. THIRD YEAR**

**BIOTECHNOLOGY (VOCATIONAL) - CURRICULUM**

**With Effect from June - 2011**

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

<b>Class</b>	<b>Paper No. Code no.</b>	<b>Title of Paper</b>	<b>Periods/ Practical's</b>	<b>Time duration of Examination</b>	<b>Maximum Marks</b>
B.Sc.IIlyr Semester-V	Paper -I VBT- 112	Plant tissue culture	45	3 Hrs.	40+10*
	Paper -II VBT-113	Environmental Biotechnology	45	3 Hrs.	40+10*
B.Sc.Ilyr Semester-VI	Paper -III VBT-114	Plant transgenesis	45	3 Hrs.	40+10*
	Paper -IV VBT-115	Bioresource Technology	45	3 Hrs.	40+10*
B.Sc.IIlyr	VBP-XVI (Practical) Annual pattern	Practical Based On Theory Papers Of VBT-112 & VBT-114	17	4 Hrs. for two consecutive days	100
B.Sc.IIlyr	VBP-XVII (Practical) Annual pattern	Practical Based On Theory Papers Of VBT-113 & VBT-115	15	4 Hrs. for two consecutive days	100

\* 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- 112 (PLANT TISSUE CULTURE)**

Periods – 45

Maximum Marks – 50

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**Unit-I (12 Periods)**

Introduction to in vitro methods. Terms and definitions. Use of growth regulators. Beginning of in vitro cultures in our country (ovary ovule culture, in vitro pollination and fertilization). Embryo culture, embryo rescue after wide hybridization, and its applications. Introduction to the processes of embryogenesis and organogenesis and their practical applications. Clonal multiplication of elite species (micro propagation) auxiliary bud, shoot tip and meristem.

**Unit-II(12 periods)**

Haploids and their applications (treasure your exceptions). Endosperm culture and production of triploids. Practical application of tissue and organ culture (summarizing the practical applications of all the above mention techniques). Single- cell suspension cultures and their applications in selection of variants/mutants with or without mutagen treatment (of haploid cultures preferably).

**Unit-III (10Periods)**

Introduction to protoplast isolation: principles and applications. Testing of viability of isolated protoplasts. Various steps in the regeneration of protoplasts. Somatic hybridization – an introduction.

**Unit-IV (11 Periods)**

Various methods for fusing protoplasts. Chemical , electrical. Use of markers for selection of hybrid cells. Practical applications of somatic hybridization (hybrids Vs Cybrids). Use of plant cell, protoplasts and tissue culture for genetic manipulation of plants.

**Text & References:**

1. Plant biotechnology - B.D.Singh
2. An introduction to Plant biotechnology –H.C. Chawla.
3. An introduction to Plant tissue culture – A.K.Razdhan
4. Biotechnology - B.D.Singh
5. Introduction to plant tissue culture – M.K. Razdan
6. 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- 113 (ENVIRONMENTAL BIOTECHNOLOGY)**

Periods – 45

Maximum Marks – 50

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**Unit-I (10Periods)**

Environment Basic concepts & issues  
Introduction to environmental biotechnology  
History of environmental biotechnology  
Why do we need biotechnology

**Unit-II (10Periods)**

Renewable and non-renewable resources.  
What is renewable should be bioassimilable/biodegradable.  
Major consumer items : Food, fuel and fibres.  
Conventional fuels and their environmental impacts: Firewood, Plant and animal wastes, Coal, Gas, Animal oils.

**Unit-III (13Periods)**

Modern fuels and their environmental impacts : Methanogenic bacteria and biogas production, Microbial hydrogen production  
Conversion of sugars to ethanol. The gasohol experiment.  
Solar energy converters – hopes from the photosynthetic pigments.  
Plant based petroleum industry.

**Unit-IV (12Periods)**

Cellulose degradation for combustible fuel  
Biotechnological inputs in producing good quality natural fibers.  
Transgenic sheep and transgenic plants .  
Treatment of municipal waste and industrial effluents.  
Solid waste : sources & Management (Composting, Vermiculture)  
Global Environmental problems: The greenhouse effect, Ozone depletion, Ultraviolet Radiation, Acid Rain, Biotechnological approaches for management.

**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

**B. Sc. THIRD YEAR BIOTECHNOLOGY (VOCATIONAL)**  
**SEMESTER – VI**  
**THEORY PAPER III**  
**VBT- 114 (PLANT TRANSGENESIS)**

Periods – 45

Maximum Marks – 50

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**Unit-I (10Periods)**

Introduction to transgenic plants. Advantages and Disadvantages.

Introduction to *A.tumefaciens*.

Tumor formation on plants using *A.tumefaciens* (monocots Vs Dicots).

**Unit-II (10 Periods)**

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)**

Applications of plant transformation ,herbicide resistance, insect resistance, virus resistance,

Drought resistance, pests resistance, long shelf life of fruits and flowers.

Chloroplast transformation, advantages.

Plant secondary metabolites, industrial enzymes, biodegradable plastic, polyhydroxybutyrate, 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- 115 (BIORESOURCE TECHNOLOGY)**

Periods – 45

Maximum Marks – 50

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**Unit-I (10 Periods)**

Degradation of pesticides and Xenobiotic compounds by microorganisms.

Biopesticides , *Thuringiensis* toxin as a natural pesticides.

Biological control of other insects swarming the agricultural fields.

Biofertilizers, Nitrogen fixing microorganisms enrich the soil with assimilable nitrogen.

Bioinoculants : Inoculum preparation, *Rhizobium*, *Trichidroma*.

**Unit-I (12 Periods)**

Enrichment of ores by microorganisms.

Bioabsorption of metals.

Bioleaching

**Unit-I (13 Periods)**

Bioremediation

Concept of Bioaccumulation

Concept of Biomagnifications.

Concept of Eutrophication

**Unit-I (10Periods)**

Biofuel & Biodiesel

Oil pollution at sea level

Biopolymers and Bioplastics

**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

**B.Sc. THIRD YEAR, BIOTECHNOLOGY ( VOCATIONAL)**  
**PRACTICAL PAPER – III (Annual)**  
**BASED ON THEORY PAPERS OF BTT-112 & BTT-114**

Practical –17

Maximum Marks – 100

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**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-113 & BTT-115**

Practical – 15

Maximum Marks – 100

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**Environment biotechnology & Bioresource technology**

Practical 1 : Estimation of calcium content of water sample.

Practical 2 : Estimation of  $\text{mg}^{++}$  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  $\text{Co}_2$  present in water.

Practical 11 : Estimation of dissolved oxygen.

Practical 12 : Qualitative analysis of water(MPN).

Practical 13 : Total alkalinity of water sample.

Practical 14 : Estimation of amount of acidity.

Practical 15 : Hardness of water sample by EDTA method.

**SKELETON OF QUESTION PAPER**  
**B.Sc. THIRD YEAR BIOTECHNOLOGY (VOCATIONAL)**  
**SEMESTER-V**  
**THEORY PAPER – XII / XIII**  
**VBT- 112 (PLANT TISSUE CULTURE) /**  
**VBT- 113 (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- 112 PLANT TISSUE CULTURE**

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|-------------|---------------------------|----|
| <b>Q.1.</b> | Short answer type (5X1)   | 05 |
| <b>Q.2.</b> | Long Answer type (5X2)    | 10 |
| <b>Q.3.</b> | Long Answer type (10X1)   | 10 |
| <b>Q.4</b>  | Multiple Choice Questions | 15 |

**VBT- 113 ENVIRONMENTAL BIOTECHNOLOGY**

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|-------------|---------------------------|----|
| <b>Q.1.</b> | Short answer type (5X1)   | 05 |
| <b>Q.2.</b> | Long Answer type (5X2)    | 10 |
| <b>Q.3.</b> | Long Answer type (10X1)   | 10 |
| <b>Q.4</b>  | Multiple Choice Questions | 15 |

**SKELETON OF QUESTION PAPER**

**B.Sc. THIRD YEAR BIOTECHNOLOGY (VOCATIONAL)**

**SEMESTER- VI**

**THEORY PAPER – XIV /XV**

**VBT- 114 (PLANT TRANSGENESIS) /**

**VBT- 115 (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
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**VBT- 114 PLANT TRANSGENESIS**

<b>Q.1.</b>	Short answer type (5X1)	05
<b>Q.2.</b>	Long Answer type (5X2)	10
<b>Q.3.</b>	Long Answer type (10X1)	10
<b>Q.4</b>	Multiple Choice Questions	15

**VBT- 115 BIORESOURCE TECHNOLOGY**

<b>Q.1.</b>	Short answer type (5X1)	05
<b>Q.2.</b>	Long Answer type (5X2)	10
<b>Q.3.</b>	Long Answer type (10X1)	10
<b>Q.4</b>	Multiple Choice Questions	15

**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: 100

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Q 1) Major Question (Plant tissue culture)	25
Q 2) Minor Question (Plant tissue culture)	15
Q 3) Major Question (Plant transgenesis)	25
Q 4) Minor Question (Plant transgenesis)	15
Q 5) Viva-Voce	10
Q 6) Record Book	10

**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: 100
Q 1) Major Question (Environmental Biotechnology)	25
Q 2) Minor Question (Environmental Biotechnology)	15
Q 3) Major Question (Bioresource technology)	25
Q 4) Minor Question (Bioresource technology)	15
Q 5) Viva-Voce	10
Q 6) Record Book	10