

॥ 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

## ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०-२१ पासून लागू करण्याबाबत.

### प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७-२०२०च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे खालील विषयांचे C.B.C.S. (Choice Based Credit System) Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०-२१ पासून लागू करण्यात येत आहेत.

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

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या [www.srtmun.ac.in](http://www.srtmun.ac.in) या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

‘ज्ञानतीर्थ’ परिसर,  
विष्णुपुरी, नांदेड - ४३१ ६०६.  
जा.क्र.: शैक्षणिक-१/परिपत्रक/पदवी-सीबीसीएस अभ्यासक्रम/  
२०२०-२१/३३३

दिनांक : १५.०७.२०२०.

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.

स्वाक्षरित / -

**उपकुलसचिव**

शैक्षणिक (१-अभ्यासमंडळ) विभाग

**Swami RamanandTeerthMarathwada University, Nanded**  
Choice Based Credit System (CBCS) Course Structure (New Scheme)

**B. Sc Second Year (Semester III)**  
**Biotechnology (Vocational Affiliated Colleges)**

Under Faculty of Science

**B. Sc. II Yr Syllabus structure**  
**Subject: Biotechnology (Vocational)**

Semester	Paper No.	Name of the Course	Instruction Hrs/ week	Total period	Internal Evaluation	Marks	Total Marks	Credits
III	CCBT III (Section A)	Genetics and Molecular Biology (Paper VI)	03	45	10	40	50	2
	CCBT III (Section B)	Bioinstrumentation (Paper VII)	03	45	10	40	50	2
	CCBTP II (Section A)	Practical based On (Paper VI) & (Paper VIII) Paper X	04	10 Practicals	10	40	50	02
	CCBTP II (Section B)	SEC-I (Any one Skill from IA/I/B) 1A-Basic techniques in molecular biology 1B-Biopesticides Production Technology	-	-	25	25	50	02
IV	CCBT IV (Section A)	r-DNA Technology (Paper VIII)	03	45	10	40	50	2
	CCBT IV (Section B)	Immunology (Paper IX)	03	45	10	40	50	2
	CCBTP III (Section A)	Practical based On (Paper VII) & (Paper IX) Paper XI	04	10 Practicals	10	40	50	02
	CCBTP III (Section B)	SEC-II (Any one Skill from IIA/IIB) IIA-Fermentation technology, IIB-Plant tissue culture Technology	-	-	25	25	50	02

**Swami RamanandTeerthMarathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year (Semester III)**  
**Biotechnology (Vocational)**  
**CCBT III Section A**  
**Genetics and Molecular Biology (Paper VI)**

**Maximum Marks: 50**

**Hours: 45**

**Objectives:** To understand the science of heredity and the structure and function of the macromolecules (e.g. proteins and nucleic acids) essential to life.

**Outcomes:** it will give in-depth knowledge of biological processes through the investigation of the underlying molecular mechanisms. The molecular mechanisms by which DNA controls development, growth or morphological characteristics of organisms will be understood along with the fundamental structure, properties and processes in which nucleic acids play a part.

**Unit I (10 periods)**

- Basic Microbial genetics: Conjugation, Transformation, transduction,
- Mutations-spontaneous & Induced; chemical & physical mutagens
- Hardy-Weinberg equilibrium.

**Unit II (10 periods)**

- DNA replication in prokaryotes and eukaryotes.
- DNA repair mechanism: Photoreactivation, Excision repair, Mismatch repair
- Structure of prokaryotes and eukaryotes gene.

**Unit III (12 periods)**

- Prokaryotic transcription: initiation, elongation, termination.
- Eukaryotic transcription: initiation, elongation, termination.
- Post transcriptional modification of m-RNA: Splicing, Capping, Polyadenylation

**Unit IV (10 periods)**

- Prokaryotic translation: initiation, elongation, termination.
- Eukaryotic translation: initiation, elongation, termination.
- Co and Post-translational modification.

**Text and Reference :**

1. Kakoli and Upadhyaya- Molecular Biology- Himalaya
2. Watson – Molecular biology of gene- Pearson
3. David Freifelder - Microbial Genetics – Narosa
4. David Freifelder – Molecular Biology – Jones and Bartlett /Narosa
5. Gardner – Principles of Genetics – Wiley international pub.
6. Simmonds &Snustad – Principles of Genetics IV ed- Wiley international
7. T.A. Brown – Genomes – Garland Science
8. Albert Bruce- Molecular biology of the cell- Garland Science.
9. Lodish - Molecular cell biology – W-H. freeman
10. B. Lewin – Genes- IX- Oxford

**Swami Ramanand Teerth Marathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year (Semester III)**  
**Biotechnology (Vocational)**  
**CCBT III Section B**  
**Bioinstrumentation (Paper VII)**

**Maximum Marks: 50**

**Hours: 45**

**Objectives:** To understand role and applications of different instruments in biotechnology

**Outcomes:** This will let to identify and describe basic principles, working and operation of various instruments / equipments. The learner will able to understand and analyse the results of the instruments and equipments meeting industry expectations.

**Unit-I (10 periods)**

- Study of compound, light, and electron microscope: SEM, TEM
- Basic law of absorption,
- Visible & Ultraviolet Spectroscopy, Application in biology

**Unit-II (13 periods)**

- Chromatographic techniques: paper chromatography, Thin layer chromatography (TLC),
- High performance liquid chromatography (HPLC) and gas liquid chromatography (GLC),
- Ion-exchange chromatography, Gel filtration chromatography.

**Unit-III (12 periods)**

- General Principles, Factors affecting on Electrophoretic Mobility,
- Agarose, PAGE & SDS PAGE. Isoelectric focusing (IEF),
- Pulse field gel electrophoresis, immuno- electrophoresis, Western blotting.

**Unit-IV (10 periods)**

- Centrifuges: principle, instrumentation and applications
- Biosensors and their applications
- Flow Cytometry

**Text and Reference :**

1. Wilson K and Walker J. Principles and Techniques of Biochemistry and Molecular Biology. CUP.
2. Nelson DL and Cox MM. Lehninger Principles of Biochemistry, W.H. Freeman and Company.
3. Karp G. Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons. Inc.
4. De Robertis EDP and De Robertis EMF. Cell and Molecular Biology. Lipincott Williams and Wilkins,

**Swami RamanandTeerthMarathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year (Semester IV)**  
**Biotechnology (Vocational)**  
**CCBT IV Section A**  
**r-DNA Technology (Paper VIII)**

**Maximum Marks: 50**

**Hours: 45**

**Objectives:** To acquaint the students with modern techniques used for manipulation of DNA, RNA and Proteins and their applications in industry, medicine, agriculture

**Outcomes:** The students will have knowledge of tools and strategies used in r-DNA Technology along with understanding the applications from academic and industrial perspective The learner will able to use and apply the knowledge of r-DNA Technology in problem solving and in practice

**Unit I (12 periods)**

- Restriction enzymes: Types and properties, ligases, polymerases, alkaline phosphatase
- Vectors: Plasmids (pBR322, pUC18/19), Bacteriophages ( $\lambda$  Phage, M 13 Phage),
- Cosmids, BAC, YAC, SV 40 and Retrovirus

**Unit II (10 periods)**

- Blotting techniques: Southern, Northern, Western Blotting and applications.
- PCR: Mechanism, Types and Application.
- Probes and its applications

**Unit III (10 periods)**

- Preparation of Genomic and cDNA library,
- Screening of recombinants, DNA fingerprinting, DNA foot printing
- DNA Sequencing: Sanger and Maxam-Gilbert method

**Unit IV (13 periods)**

- Recombinant insulin, Recombinant vaccine, Recombinant growth hormone, Blood Clotting factors VIII, Tissue Plasminogen Activator.
- Production and applications of transgenic animals.
- Gene therapy.

**Text & References:**

1. Principles of Gene Manipulation and Cloning - Old & Primrose-Black well Science
2. From Genes to Clones- Winnacker- Panima
3. Molecular Biotechnology –Glick-ASM
4. ABC of Gene cloing- Wong-Springer
5. Genomes 3 - T.A.Brown-Garland Science
6. Gene cloning and DNA Analysis- T.A. Brown- Wiley- Blackwell
7. Text book of Biotechnology – U Satyanarayan –Book & Allied
8. Jogdand S.N- Gene Biotechnology-Himalaya
9. Joshi P (2002) - Genetic Engineering and its applications, Agrobios Pub
10. MitraSandhya (2006) - Genetic Engineering, MacMillan India

**Swami RamanandTeerthMarathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year (Semester IV)**  
**Biotechnology (Vocational)**  
**CCBT IV Section B**  
**Immunology (Paper IX)**

**Maximum Marks: 50**

**Hours: 45**

**Objectives:** To study how the immune system its component and mechanism it protects us from infection through various lines of defense

**Specific Course Outcome:**

The course will enable to understand the basic components of the immune system that protect the host against pathogenic organisms. The Concept of cells and organs related to immune system, types of Immunity and Immune response, immune mechanism, Hypersensitivity, vaccines and immune based tests.

**Unit I (10 periods)**

- Infection: Definition, types of infections, sources of infection, modes of transmission, Microbial pathogenicity.
- Immunity: Innate and adaptive
- Humoral and cell mediated immunity

**Unit II (10 periods)**

- Organs and cells of immune system.
- Antigen: Definition, general properties, antigen specificity, Haptens and adjuvants
- Antibody: Definition, properties, structure of immunoglobulin, immunoglobulin types

**Unit III (12 periods)**

- Hypersensitivity: Definition and types. Localised reactions.
- Complement: Definition and activation pathways.
- Transplantation immunology: Graft types, rejection reactions

**Unit IV (13 periods)**

- Antigen antibody reactions: Agglutination, precipitation, complement fixation.
- Immunofluorescence, RIA, ELISA.
- Types of Vaccines. Interferons, Vaccination programme in India.

**Text and Reference :**

1. Immunology – Kuby- W.H. Freeman
2. Essentials of Immunology- Roitt I. M.- Blackwell
3. Immunology- Nandini Shetty- New Age International
4. Textbook of Microbiology – Anantnarayan and Panikar-Orient Longman
5. Immunology- A.K. Abbas- Elsevier.
6. A textbook of immunology- Nagoba and Vedpathak.

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Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year Year (Semester IV)**  
**Biotechnology (Vocational)**  
**CCBTP II Section B**  
**Practical paper based on Paper VI and Paper VIII (Paper X)**

**Maximum Marks: 50**

**credit: 02**

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01. Isolation and quantization of DNA and plasmid from Bacteria.
  02. Effect of UV radiation on yeast / bacteria
  03. Study of DNA repair mechanism by photo reactivation.
  04. Bacterial Transformation, Bacterial Conjugation, Bacterial Transduction.
  05. Agarose gel electrophoresis of genomic DNA & plasmid DNA.
  06. Restriction digestion of DNA
  07. Ligation of DNA
  08. Preparation of Competent Cells and transformation
  09. Blotting Techniques- Southern, Western
  10. Principle and study of PCR based experiments

**Swami RamanandTeerthMarathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year Year (Semester IV)**  
**Biotechnology (Vocational)**  
**CCBTP II Section B**  
**Practical paper based on Paper VII and Paper IX (Paper XI)**

**Maximum Marks: 50**

**credit: 02**

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01. Study of compound microscope
02. Study of UV, Visible spectrophotometer.
03. Verification of Lambert-Beer's law.
04. Separation of amino acids by TLC & paper chromatography.
05. Study of centrifuge.
06. Widal slide test, tube test, VDRL test Blood Group determination
07. RBC count WBC count
08. Differential Leukocyte Count
09. ELISA
10. RA



**Swami RamanandTeerthMarathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year**  
**Biotechnology (Vocational)**  
**SECBT-IA Basic techniques in molecular biology**  
**Semester III**

Unit I

UV-Visible spectroscopy: Principle and applications

Centrifugation: Principle, types and applications

Unit II

Agarose gel electrophoresis and SDS PAGE: Principle, working and applications

Chromatography: Principle, types and applications

Unit III

PCR: Principle types and applications

Biosensor: Principle, construction and applications

Unit IV

ELISA, Southern blotting, western blotting, Northern blotting, Flow cytometry

Practicals

1. Extraction of genomic DNA from bacteria, yeast
2. Separation of Pigments/ Biomolecules by Chromatography
3. Principles and working of different centrifuges
4. Spectrophotometric analysis of DNA, RNA and proteins
5. Agarose gel electrophoresis of DNA
6. SDS-PAGE.
7. ELISA

References

1. Biophysical Chemistry- Upadhyay, Upadhyay and Nath-Himalaya
2. Practical Biochemistry- Wilson & Walker -Cambridge
3. Practical Biochemistry- David Plummer- Tata McGraw Hill
4. Physical Biochemistry- David Friefelder
5. Instrumental Methods of Chemical Analysis- Chatwal Anand- Himalaya
6. Instrumental Methods of Chemical Analysis –B.K. Sharma-Goel

**Swami RamanandTeerthMarathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year Year**  
Semester Pattern effective from .....

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**Biotechnology (Vocational)**  
**SECBT -IB Biopesticides Production Technology**  
**Semester III**

Unit I

Introduction to biopesticides, Types, Applications, Advantages and disadvantages of biopesticides.

Unit II

*B.thuringiensis* and *Trichoderma* as biopesticide, Biological pest control, Integrated pest management

Unit III

Bioinsecticide, Biofungicide, Bioherbicide.

Unit IV

*Pseudomonas fluorescens* biocontrol agent. Present status and future needs of biopesticides.

Practicals

1. Isolation of *B.thuringiensis*
2. Isolation of *Trichoderma herzianum*
3. Inoculum preparation of *Trichoderma herzianum*
4. Inoculum preparation of *Pseudomonas fluorescens*

References

1. Biotechnology: R.C.Dubey S.Chand publications
2. Biotechnology: B.D.Singh
3. Elements of Biotechnology: P.K.Gupta, Rastogi publications
4. Microbiology: R.C.Dubey S.Chand publications

**Swami RamanandTeerthMarathwada University, Nanded**  
Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year Year (Semester IV)**  
Semester Pattern effective from .....

**Biotechnology (Vocational)**  
**SECBT-IIA Fermentation technology**  
**Semester IV**

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Unit I

Fermenters, Bioreactors: Construction, Design & Operation, Materials of Constructions Properties of ideal fermenter.

Unit II

Fermentation Processes.

Fermentation processes: Microorganisms involved, Inoculum preparation, Medium used and product Recovery of Protease, pectinase, Alcohol

Unit III

Fermentation Processes.

Fermentation processes: Microorganisms involved, Inoculum preparation, Medium used and product Recovery Organic acid: Citric acid. Antibiotic: Penicillin

Unit IV

Fermentation Economics, Concept of QC, QA, Good Laboratory Practices, GMP.

Practicals

1. Isolation and Screening of Industrially important Microbes-Acid, Antibiotics, Enzymes
2. Fermentative production purification and estimation of antibiotics/ vitamins
3. Fermentative production purification and estimation of Citric Acid
4. Fermentative production purification and Estimation of alcohol using *Sacharomyces cerevisiae*

Text &References:

1. Casida L.E - Industrial Microbiology- New Age
2. Crueger W and Crueger A - Biotechnology: A Textbook of Industrial Microbiology-Panima Publishing
3. Patel A.H. - Industrial Microbiology, Macmillan India
4. Pepler H.J and Perlman D - Microbial Technology, Vol I and II-Elsevier
5. Stanbury P.F., Whitaker A. and Hall S.J - Principles of Fermentation Technology-Elsevier
6. Prescott and Dunn's- Industrial Microbiology-CBS

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Choice Base Credit System (CBCS) Course Structure (New Scheme)  
**B.Sc Second Year Year (Semester IV)**  
Semester Pattern effective from .....

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**Biotechnology (Vocational)**  
**SECBT-IIB Plant tissue culture Technology**  
**Semester IV**

Unit I

Introduction and History of plant tissue culture Techniques, structure and organization of plant tissue culture laboratory

UnitII

Tissue culture media: Types, composition and preparation, maintenance of callus and suspension culture, sterilization techniques.

Unit III

Micropropagation: Introduction, meristem culture, stages of micro propagation, Applications of micro propagation. Haploid production.

Unit IV

Protoplast isolation, protoplast culture, protoplast fusion  
Commercial applications of tissue culture technology.

**Practicals**

1. Introduction, general operations, precautions at cell culture laboratory
2. Preparation of tissue culture media
3. Sterilization of explants
4. Callus culture and organ culture
5. Protoplast isolation
6. Meristem culture.

**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