

॥ 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 प्रथम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९-२० पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक ०८ जून २०१९ रोजी संपन्न झालेल्या ४४व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/४४-२०१९ च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील प्रथम वर्षाचे खालील विषयांचे C.B.C.S. (Choice Based Credit System) Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९-२० पासून लागू करण्यात येत आहेत.

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|-------------------------------------------------------|---------------------------------------|
| 1. Agricultural Microbiology | 18. Dyes and Drugs |
| 2. Agrochemicals & Fertilizers | 19. Electronics |
| 3. Analytical Chemistry | 20. Environmental Science |
| 4. B.C.A. | 21. Fishery Science |
| 5. B.Voc. (Food Processing, Preservation and Storage) | 22. Food Science |
| 6. B.Voc. (Web Printing Technology) | 23. Geology |
| 7. Biochemistry | 24. Horticulture |
| 8. Bioinformatics | 25. Industrial Chemistry |
| 9. Biophysics | 26. Information Technology (Optional) |
| 10. Biotechnology (Vocational) | 27. Mathematics |
| 11. Biotechnonology | 28. Microbiology |
| 12. Botany | 29. Network Technology |
| 13. Chemistry | 30. Physics |
| 14. Computer Application (Optional) | 31. Software Engineering |
| 15. Computer Science (Optional) | 32. Statistics |
| 16. Computer Science | 33. Zoology |
| 17. Dairy Science | |

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या 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-०१/परिपत्रक/पदवी-सीबीसीएस अभ्यासक्रम/
२०१९-२०/२९२

दिनांक : ०३.०७.२०१९.

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.**

Faculty of Science and Technology

**SYLLABUS
B.Sc. (Biotechnology) Vocational**

**First, Second & Third Year (CBCS Pattern)
(SEMESTER I, II, III, IV, V & VI)**

Salient Features

B. Sc. Vocational Biotechnology syllabus is designed to serve the need of Choice Based Credit System (CBCS) course structure to orient and practically train students in the field of Biotechnology. The course consists of skill enhancement course in enzyme technology and Environmental contamination and abatement. The first discipline specific elective course in plant tissue culture is based on micropropagation, germplasm conservation, haploid production, somatic hybridization that will help students to understand different techniques in plant tissue culture and its advantages over traditional methods of propagation. The second discipline specific elective course in environmental biotechnology will help students to understand recent environment related issues and its relation to biotechnology. The third discipline specific elective course in plant transgenesis includes transgenic plants, R_i & T_i plasmids, Mechanism of DNA transfer. This course will introduce the students to transgenic plants that are the important step forward in the production of agricultural crops that are modified to contain specific characters like resistant to drought, pests etc. The fourth course discipline specific elective in Bioresource technology consists of Biodegradation, Biopesticides, Bioremediation and Biofuel. The course will acquaint students with training of wider range of technologies and various elements such as biomass, biological waste treatment, bioenergy, biodegradation, bioresource systems analysis, bioremediation etc.

Skill enhancement course in enzyme technology is well suited to understand production, purification and application of industrial enzymes. The other course in Environmental contamination and abatement Skill enhancement course will help to understand global problems like pollution and biomedical waste treatment their control through biotechnological practices.

Utility

The syllabus of B. Sc. Third year Biotechnology vocational course will train the students in field of Plant tissue culture, Environmental Biotechnology, Plant transgenesis and Bioresource technology. The syllabus will also help students to understand and combat environment related issues through biotechnology. Bioresource technology will acquaint students with utilization of biological resources for welfare of human being and to understand and apply this knowledge for carrier selection. The courses in Skill enhancement will provide additional opportunity for a student to develop skills of interest in this field of study for better employability.

Prerequisite

The course is offered for a student registered for undergraduate programme in the faculty of Science and Technology who had primary knowledge and training in the field of basic biological, chemical, mathematical and physical sciences and interested to gain additional advanced knowledge in the field of biotechnology.

Course Objectives:

1. To prepare students for developing a career in biotechnological based industry and research institutes.
2. To develop the students for inculcating the ability to apply modern techniques in biotechnological industry and research.
3. To enable students to work in a team as well develop ability to lead the team with multidisciplinary approach.
4. To cultivate fundamental strength of analyzing, designing and solving industry related problems. In the students and make them proficient in skills in the different applied areas of biotechnology.
5. To encourage and instill the ethics and code of professional practice among students.
6. To make the students aware of recent global issues related to biotechnology.

Course Outcomes:

1. The students will be able to demonstrate basic knowledge in modern and applied biological sciences after successful completion of B. Sc. with Biotechnology.
2. The students would acquire basic knowledge and skills to design and conduct experiments, analyze data and interpret the results.
3. The students will be able to demonstrate understanding of modern techniques and acquire knowledge to apply solutions used in biotechnology and bio-based industries.
4. The student will be able to demonstrate ability to provide solutions in the fields of modern biotechnological applications with skills and recent advances in biotechnology
5. The graduates will acquire first-hand experience at individual level and exposure to industrial and research environment.

Distribution of credits for B.Sc. Biotechnology (Vocational)
Under Faculty of Science
B. Sc. Syllabus structure
Subject: Biotechnology (Vocational)

Semester	Paper No.	Name of the Course	Instruction Hrs/ week	Total period	Internal Evaluation	Marks	Total Marks	Credits
I	CCBT I (Section A)	Cell Biology (Paper I)	03	45	10	40	50	2
	CCBT I (Section B)	Introductory Microbiology (Paper II)	03	45	10	40	50	2
II	CCBT II (Section A)	Math, Statistics & Computers (Paper III)	03	45	10	40	50	2
	CCBT II (Section B)	Biochemistry (Paper IV)	03	45	10	40	50	2
	CCBTP I [CCBT I & CCBT II (section A & section B)]	Practicals based on section A and section B of CCBT I and CCBT II (Paper V)	04	20 Practicals	20	80	100	04
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-(Bioagents in Agriculture) IIB- Enzyme Technology	-	-	25	25	50	02
V	DECBT I (Section A)	Plant Tissue Culture (Paper -XII)	03	45	10	40	50	2

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

Distribution of credits for B.Sc. Biotechnology (Vocational)
 Under Faculty of Science
B. Sc. I Year Syllabus structure
Subject: Biotechnology (Vocational)

Semester	Paper No.	Name of the Course	Instruction Hrs/ week	Total period	Internal Evaluation	Marks	Total Marks	Credits
I	CCBT I (Section A)	Cell Biology (Paper I)	03	45	10	40	50	2
	CCBT I (Section B)	Introductory Microbiology (Paper II)	03	45	10	40	50	2
II	CCBT II (Section A)	Math, Statistics & Computers (Paper III)	03	45	10	40	50	2
	CCBT II (Section B)	Biochemistry (Paper IV)	03	45	10	40	50	2
	CCBTPI [CCBT I & CCBT II (section A & section B)]	Practicals based on section A and section B of CCBT I and CCBT II (Paper V)	04	20 Practicals	20	80	100	04

Swami RamanandTeerthMarathwada University, Nanded
Choice Base Credit System (CBCS) Course Structure (New Scheme)
B.Sc First Year (Semester I)
Biotechnology (Vocational)
CCBT I (Section A)Cell Biology (Paper I)

Maximum Marks: 50

Hours: 45

Unit-I (10 periods)

- The cell theory
- Classification of cell types: PPLO's, bacteria, Plant and animal cells.
- Introduction of stem cells.

Unit-II (10 periods)

- Biochemical composition of cells (proteins, lipids, carbohydrates, nucleic acids)
- Different Plasma Membrane models.
- Structure and Function of cell wall
- Cell-cell interaction : (Plasmodesmata, Gap junction and Tight junction).

Unit-III (12 periods)

- Structure and function of the cell organelles: Golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes, cytoskeleton structures(microfilament, microtubules intermediate filaments etc.), mitochondria, chloroplast, nucleus (nuclear membrane, nucleoplasm, nucleolus, chromatin), lysosomes, cilia, flagella, microbodies; glyoxysomes,Peroxisomes, melanosomes.

Unit-IV (13 periods)

- Cell division; Mitosis & Meiosis.
- Cell cycle.
- Cell locomotion (amoeboid, flagellar and ciliar).
- Cell death.

Text & References:

1. Cytology and Genetic – V R Dnyansagar.
2. Molecular biology of the Cell – Bruce Alberts
3. Molecular Cell Biology - Lodish.
4. Cell Biology CB Powar.
5. Cell and molecular Biology Gerald Karp.
6. Cell Biology – Sadava

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

B.Sc First Year (Semester I)

Semester Pattern effective from

Biotechnology (Vocational)

CCBT I (Section B) Introductory Microbiology

Paper II

Maximum Marks: 50

Hours: 45

Unit I(10 periods)

- History of Microbiology: A.V.Leeuwenhoek, Controversy over spontaneous generation, Louis Pasteur, Robert Koch
- General characters of: Bacteria, Archea, Viruses, Eukaryotic microbes.
- Beneficial & Harmful role of microorganisms.
- Basic and applied areas: Medical Microbiology, Soil and Agricultural Microbiology, Food and Dairy Microbiology, Industrial microbiology,

Unit II(13 periods)

- Ultrastructure of bacterial cell
- Gram positive and gram negative bacterial cell wall
- Nutritional requirements of microorganisms, Nutritional types of microorganisms.
- Types of Culture media with examples (Defined, Selective, Natural, Differential, enrichment, Synthetic).
- Methods for isolation of pure culture . (Streak, pour, Spread plate method).

Unit III(12 periods)

- Bacterial growth curve, Phases of growth, Measurement of bacterial growth
- Batch culture, Continuous culture
- Control of microbial growth: Methods of Sterilization (Heat, chemical, radiation, filtration).

Unit IV(10 periods)

- Significance of normal flora and probiotics in human health
- Microbes as Biofertilizers and Biocontrol Agents (e.g. Nitrogen fixers, Phosphate Solubilizers and *Bacillus thuringiensis*).

Text & References:

1. General Microbiology-Powar and Dagainawala.
2. Fundamental Principles of Bacteriology Iled. A.J.Salle. TATA-McGrawHill(Pub.).
3. General Microbiology-Pelczar.
4. Text-book of microbiology- Anantnarayan, C.K. Jayram, Panikar, Orient Longman.
5. General Microbiology – Dey and Dey.
6. Text-book of microbiology-R.C.Dubey
7. General Microbiology – Stryer

Swami RamanandTeerthMarathwada University, Nanded
Choice Base Credit System (CBCS) Course Structure (New Scheme)
B.Sc First Year (Semester II)
Biotechnology (Vocational)
CCBT II Section A
Mathematics, Statistics & Computers (Paper III)

Unit –I (12 Periods)

- The set theory properties of subsets
- Linear and geometric function
- Limits of functions ,derivatives of function
- The binomial theorem

Unit –II (10 Periods)

- Logarithm
- Differentiation
- Integration
- Probability calculation

Unit –III (13 Periods)

- Introduction to biostatistics sampling techniques data collection tabular and Graphical
- Representation of data. Mean, Mode, Median, range variance standard deviation and
- Test significance: Z test, T-test, Chi-square

Unit – IV (10 Periods)

- Computer: Parts of computer, Types of computer, computer generations
- Introduction to operating systems - windows and Linux, UNIX,
- MS office: MS Word, MS Excel, MS powerpoint
- Application of computer in biotechnology

Text and Reference:

1. Bailey N.T.J Statistical methods in biology.
2. Visweshwara R.K. Biostatistics, Jaypee New Delhi.
3. Batschelete : Introduction to Mathematics for life scientists , Springer Verlag New York.
4. Mathematical statistics H.C. Saxena and V.K. Kapoor S Chand.
5. Fundamentals of Statistical Methods - S.P. Gupta
6. Schaum's outline of introduction of computer science - Pushman and R. Mata, Mc. Grawhill
7. Fundamentals of Computer - Rajaramana
8. Computer Fundamentals – Oka
9. Fundamental Computer – Sinha

Swami RamanandTeerthMarathwada University, Nanded
Choice Base Credit System (CBCS) Course Structure (New Scheme)
B.Sc First Year (Semester II)
Biotechnology (Vocational)
CCBT II (Section B)
Biochemistry (Paper IV)

Maximum Marks: 50

Hours: 45

Unit I (10 Periods)

- Definition and classification of Carbohydrates
- Examples and Structure of Triose, Pentose, Hexose
- Disaccharides:- Lactose, Maltose and Sucrose
- Oligosaccharides
- Polysaccharides:- Homo and Heteropolysaccharides (Starch, Cellulose, Mucopolysaccharides)
- Biological Significance of carbohydrates.

Unit II (13 Periods)

Proteins

- Classification (on the basis of solubility, molecular weight, shape, composition)
- Structure (Primary, Secondary, Tertiary and Quaternary) with examples.
- Role in biological system.
- Denaturation and renaturation of proteins

Enzymes

- Nomenclature and Classification.
- Role of enzymes
- Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups.

Unit III (12 Periods)

- Nucleic Acids: Nucleosides and Nucleotides, Ribose, Deoxyribose sugars.
- DNA:- Structure and Functions, Forms of DNA, Denaturation and renaturation of DNA
- RNA:- Types of RNA, Structure and Functions

Unit IV (10 Periods)

Lipids

- Classification (Saturated and Unsaturated fatty acid)
- Simple and conjugated lipids
- Biological importance of Lipids.

Vitamins

- Classification
- Physiological role
- Deficiency disorder of vitamins

Text & References:

1. Biochemistry- U. Satyanarayana & Chakrapani- New Age
2. General Biochemistry- J.H. Weil- New Age
3. Fundamentals of Biochemistry- A.C. Deb- Central publication
4. Lehninger Biochemistry- Kalyani Publication
5. Principle of Biochemistry- Cohn and Stumpf.
6. Biochemistry- Powar & Chatawal- Himalaya
7. Biochemistry- J.L Jain- S.Chand
8. Biochemistry- Rastogi- Tata McGraw Hill
9. General Microbiology- Powar & Dagainawala- Himalaya Publication

Swami RamanandTeerthMarathwada University, Nanded
Choice Base Credit System (CBCS) Course Structure (New Scheme)
B.Sc First Year (Semester II)
Biotechnology (Vocational)
CCBTP I (Section A) Practicals Paper V

Maximum Marks: 100

credit: 04

01. General and Safety Rules of Laboratory
02. Preparation of Standard solutions – Molar, Molal, Normal, Percent
03. Cleaning of glassware and Aseptic techniques, Preparation of media, cotton plugging and sterilization
04. Microscopy; Bright field microscope
05. Preparation of Buffers Solutions and Study of Enzymes
06. Study of different Cell types
07. Isolation of microorganisms from air, water and soil samples
08. Isolation of microorganisms by streak plate, pour plate, spread plate method
09. Simple staining, Gram staining
10. Growth curve of microorganisms.
11. Study of Meiosis and Mitosis.
12. Study of Karyotyping.
13. Study of Osmosis.
14. Estimation of Carbohydrate by DNS Reagent, Estimation of Protein by Biuret method
15. Qualitative estimation of DNA by Diphenylamine method, Determination of acid value of oil and fat.
16. Problems on Derivations of functions, limits
17. Problems on Differentiation, Integration, probability.
18. Problems on mean mode median & std derivation
19. Introduction to computers, Preparation of PowerPoint presentation, Introduction to MS Word
20. Visit to research laboratory, industry or field visit.