।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, 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

25 1994 - 2019 SILVER JUBILEE YEAR

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील B.Sc.-I Year-Bioinformatics (Optional) या विषयाचा CBCS Pattern नुसारचा अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील प्रथम वर्षाचा** खालील विषयाचा **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचा अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्याच्या दृष्टीने मा. कुलगुरू महोदयांनी मा. विद्या परिषदेच्या मान्यतेच्या अधीन राहून मान्यता दिलेली आहे.

1. B.Sc. – I Year – Bioinformatics (Optional)

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेत–स्थळावर उपलब्ध आहेत. तरी सदरील बाब ही बाब सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक/१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०१९–२०/**१७२५**
दिनांक : १५.१०.२०१९.

स्वाक्षरित/–
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ विभाग)

प्रत माहिती व पुढील कार्यवाहीस्तव :

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

SWAMI RAMANAND TEERTH MARATHWADA UNIVERISTY, NANDED

SEMESTER PATTERN CURRICULUM UNDER

CHOICE BASED CREDIT SYSTEM (CBCS) FOR
Under Graduate Course
Faculty of Science and Technology

SUBJECT: BIOINFORMATICS

CLASS: B. Sc. FIRST YEAR

Semester/ Annual	Course Name		Paper No. & Title	Total Periods (periods/ week)	Marks for		Credits (Marks)
					External (ESE)	Internal (CA)	
Semester-I	CCBI-I	Section-A	**Theory Paper-I:** Introduction to Bioinformatics	45 (03/week)	40	10	Credits: 02 (Marks:50)
		Section-B	**Theory Paper-II:** Basics of Biological Science	45 (03/week)	40	10	Credits: 02 (Marks:50)
Semester-II	CCBI-II	Section-A	**Theory Paper-III:** Fundamentals of Biomolecules	45 (03/week)	40	10	Credits: 02 (Marks:50)
		Section-B	**Theory Paper-IV:** Basics of Biocomputing	45 (03/week)	40	10	Credits: 02 (Marks:50)
Annual pattern	CCBIP-I		**Practical Paper-V:** Practicals based on theory papers of CCBI-I&II	24 Prac. (03/week/ batch)	80	20	Credits: 04 (Marks:100)
				Total	240	60	Credits: 12 (Marks:300)

CCBI: Core Course Bioinformatics, **CCBIP**: Core Course Bioinformatics Practical, **ESE**: End Semester Examination, **CA**: Continues Assessment,

Distribution of Credits: 80 % of the total credits for the ESE and 20% for CA
CA of 10 Marks (Theory) : 05 Marks for test & 05 Marks for Assignment
CA of 20 Marks (Practicals): : 10 Marks for test &10 Marks for Record Book ,Submission of collection and field note and Excursion Report.

B.Sc. Bioinformatics FY Syllabus
Introduction to Bioinformatics -CCBI-1A
Section A Theory Paper - I

Maximum Marks: 50 Hours: 45 Credits: 2

Objective: To have overview and understanding of world of Bioinformatics with applications.
Outcome: Students become able to understand the role and applications of Bioinformatics in different fields.

Unit -I: Introduction to Bioinformatics:
Various definitions of bioinformatics, history of bioinformatics, applications of bioinformatics, scope of bioinformatics, bioinformatics in business. Introduction to central dogma of molecular biology.

Unit -II: Internet and Bioinformatics:
General purpose search engine: Google, Biological search engine: Entrez, SRS. What is Database? Types of Databases Biological databases: Primary databases –GenBank, DDBJ, EMBL. Protein sequence databases –Swissprot, Uniprot, TrEMBL, Structural databases –PDB, PubChem, Chem Bank,. Bibliographic databases:-Pubmed, PMC, PloS.

Unit -III: Human Genome Projectand Biological data mining:
The Human Genome Project, Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, applications of data mining.

Unit -IV: Sequence and Molecular File Formats:
Sequence File Formats, Molecular File Formats and file Conversion Tools Introduction to advance fields of Bioinformatics: Genomics, Proteomics, Transcriptomics, Metabolomics, Pharmacogenomics, Pharmacogenetics, Rational Drug Designing, CADD.

Reference Books:-

1. Bioinformatics Concepts Skills and Application-S.C. Rastogi-PHI
2. Essentials of Bioinformatics-Jin Xion-Cambridge
3. Introduction to Bioinformatics-Attwood & Parry Smith-Pearson
4. Bioinformatics-CSV Murthy-Himalaya
5. Introduction to Bioinformatics-Arthur M. Lesk, -Oxford University
6. Bioinformatics Computing-Bergeron-PHI
7. Discovering Genomics Proteomics and Bioinformatics-Campbell, Heyer-Pearson
8. Data mining: Introductory and advanced-Margeret H. Dunham-IE publisher

Practicals:-
1. Use of different browsers, search engines for desired data retrieval
2. Study of major bioinformatics companies in India and overseas
3. Explore the sitemap of NCBI. Study the resources available on NCBI.
4. Study format of Genbank entry data retrieval from Genbank
5. Retrieve the Genbank entry with Specific accession number
6. Retrieving Protein sequences from protein database
7.Sequence File Formats.
8. Molecular File Formatsand file Conversion Tools
9. Visit and report on bioinformatics research institute/ company

B.Sc. Bioinformatics FY Syllabus
Basics of Biological Sciences -CCBI-2A
Section - B Theory Paper - II

Maximum Marks: 50 **Hours: 45** **Credits: 2**

Objective:
To study and understand basic life forms and biodiversity
Learning outcome: students get knowledge about life forms and biodiversity

Unit-I: Bacteria
Morphology of Bacteria, Size and shape, Arrangements. Ultra Structure of bacterial cell: Cell wall, Cell membrane, Flagella cytoplasmic inclusions. Bacterial endospore, Bacterial Nutrition, Reproduction & growth curve

Unit-II: Fungi
General characteristics of fungi, Ultrastructure of typical fungal cell, hyphae structure, Nutrition (Saprophyte, parasitic, Symbiotic), Reproduction, Meiotic & Mitotic spores, dormancy population and colonization, effect of environment on growth, prevention of fungal growth. Types study-Yeast, Agaricus.

Unit-III: Virus
Biology of viruses, Bacteriophages, Replication of Virus, genome, General properties of virus: Morphology, Classification and Nomenclature of virus, Virus cell interactions.

Unit-IV: Algae
General characters, spirogyra spirulina, chlorella, cultivation and economic importance of algae. Lichens Types or forms, external and internal structure, economical importance.

Reference Books:
1. General Microbiology-Powar and Daginawala-Himalay Publication
2 A textbook of Microbiology-R.C. Dubey and D.K. Maheshwari
3. An Introduction to Mycology-K.R.Aneja-New Age
4. An Introduction to Fungi-H.C. Dubey-Vikas
5. Fungi for Degree Students-Vashist-S.Chand
6. Microbiology-Pelczar-TataMcGraw Hill
7. An Introduction to Viruses-Biswas-Vikas
8. Viruses and Plant Diseases-Mishra-DPH

Practicals:
1) General Rules and Safety in Microbiology Laboratory.
2) Study of basic requirements in Microbiology Laboratory
   i) Autoclave ii) Hot air oven iii) Incubator
3) Isolation of microorganisms from soil, water and air.
4) Simple staining & Gram staining
5) External and internal structure of Yeast and Agaricus.
6) Types of lichens

Introduction to Biomolecules-CCBT-2A

Section A Theory Paper - III

Maximum Marks: 50 **Hours: 45** **Credits: 2**

Objective:

To focus on the basic concept of Biomolecules & their physiological role in life.

Outcome: Students will analyze the structure and functions of biomolecules in life forms. They will acquire the lab skills for the estimation of biomolecules.

UNIT-I: Carbohydrate:

Nomenclature, Classification (Monosaccharide's, oligosaccharides, polysaccharide), structure & functions, chemical properties and structural aspects of Monosaccharide's (Glucose), Disaccharides (Sucrose, Lactose) and polysaccharides (Starch, Glycogen).

UNIT-II: Amino Acid:

Classification and Structure, Physical and Chemical properties. Peptides- Nomenclature, Classification and examples.

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

Enzyme- Nomenclature and Classification. Role of enzymes.

UNIT-III: Nucleic Acid:

Structure of nucleic acid – Nitrogenous bases, pentose, nucleotides, nucleosides, nucleoside di and triphosphate. Basic structure of DNA & RNA, Forms of DNA, Types of RNA, physicochemical properties and biological function of nucleic acids.

UNIT-IV: Lipid-

Classification (Saturated and Unsaturated fatty acid) structure and Biological role, Cholesterol.

Vitamin-Definition and classification of Vitamins, Water soluble Vitamins:- Structure ,Function and properties of Vit. B1, B2, B6 and C. Deficiency, Disorder and clinical Significances. Fat soluble Vitamin:-Structure, Function and properties of Vit A, D, E and K. Deficiency, disorder and clinical Significances.

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. Lehniger 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 & Daginawala- Himalaya Publication.

Practical:

1. General and Safety Rules of Laboratory
2. Preparation of Standard solutions – Molar, Molal, Normal, Percent.
3. Identification of Bio molecules by Spot test.
4. Study of Lambert Beer's Law
5. Estimation of Carbohydrate by DNS Reagent.
6. Estimation of Protein by Biuret method.
7. Qualitative estimation of DNA by Diphenylamine method.
8. Determination of acid value of oil and fat.
9. Estimation of vitamin by DNPH/ Iodometric method.
10. Preparation of Buffers Solutions

11. Study of Enzymes

B.Sc. Bioinformatics FY Syllabus
Basics of Biocomputing
Section B Theory Paper - IV

Maximum Marks: 50 **Hours: 45** **Credits: 2**

Objective:

To understand fundamentals of computer hardware and software Learning outcome: Students will learn the general Basic architecture of computer, concept of operating system, Hardware

Unit I Computer system

Characteristics and Capability Basic structure, Block diagram of computer, ALU, Memory, CPU, I/O devices, development of computers, classification of computers (microcomputers, minicomputers, mainframe, supercomputer, PC, server, workstation) Programming language concept (Low level and high level languages)

Unit II: Input/ Output Devices and computer Memory

Keyboard entry, direct entry: Card readers, scanning devices (Barcode, OMR MICR), Voice input devices, pointing devices (light pen, mouse, touch screen, digitizer, scanner), printers: Dot matrix, inkjet, laser, plotter, CRT, LCD, CD-Writer, ZIP drive Types of memory: RAM, ROM, PROM, EPROM, EEPROM etc., Base memory, Extended memory, expanded memory, virtual memory, cache memory, storage devices: tape, FDD, HDD, CD, DVD, Flash drive.

Unit III : Introduction to Operating System

DOS/ Windows Fundamentals of DOS, file and directory, booting procedure of DOS, DOS commands (internal and external), configuration of DOS (config.sys), Batch file concept (autoexec.bat)Features of MS-Windows, GUI, Multitasking etc, Main modules of Windows OS: program manager, control panel, Networks, Elements of Windows: Desktop, applications, icons, Switching between applications: running MS-DOS applications, Windows help, Windows Accessories: Notepad, paintbrush, study of important files of windows (DLL, INI)Introduction to Linux operating system Introduction to Linux –Features of Linux; Hardware Requirements Installation, Important Linux Commands.

Unit IV: Introduction to MS Office

MS office: MS Word-Word processing, editing, saving, inserting tables, MS Excel-Spreadsheet, Tables &Charts, Formulas, MS Power Point: Creating presentation, Introduction to MS-Access

Reference Books:-

1. Fundamentals of Computer by V. Rajaraman-PHI
2. Computer Fundamentals-P.K. Sinha-BPB Publication
3. MS DOS-Russel-BPB
4. DOS-Satish Jain-BPB
5. Windows 2000 Complete Reference-BPB
6. Linux complete Reference-Richard Peterson-Tata McGraw Hill
7. Ms Office 2000-Leary-Tata McGraw Hill

Practicals:-

1. Study of various I/O devices
2. Various internal and external DOS commands
3. Study of memory types of computer
4. Practical based on MS-Word, MS-Excel, MS-PowerPoint
5. Study of Linux Operating System