|| 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

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्याशाखेने **दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व दिनांक १२ जून २०२१ रोजी संपन्न झालेल्या ५१ व्या मा. विद्या परिषद बैठकीतील विषय क्र. २६/५१–२०२१**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

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

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२१–२२/७५

दिनांक : १२.०७.२०२१.

स्वाक्षरित
सहा.कुलसचिव
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) 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.
७) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERISTY, NANDED

SEMESTER PATTERN CURRICULUM UNDER

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

SUBJECT: BIOPHYSICS

B.Sc. Third Year

With Effective from June 2021

B.Sc. Biophysics Third Year Semester V & VI Syllabus [CBCS Pattern] (2021-22)

Sem.	Code & Paper Code	Title of the paper	Period / week	Total period	End Semester Exam (ESE)/ External	Continuous Assessment (CA) /Internal	Total Marks	Credits
V	DSEB -P-IX	Radiation Biophysics	03	45	40 Marks	10 Marks (Tests/ Assignments: 10 Marks)	50	02
	DSEB -P -X	Bioinformatics & Structural Biology	03	45	40 Marks	10 Marks (Tests/ Assignments: 10 Marks)	50	02
	SECB -P-I	Communication Skills/ Enzyme Immobilization techniques	03	45	25 Marks: (Report:10, Exam:10, Viva:5)	25 Marks (Tests/Assignments: 15, overall Judgment:10)	50	02
VI	DSEB -P -XI	Immunology	03	45	40 Marks	10 Marks (Tests/ Assignments: 10 Marks)	50	02
	DSEB -P - XII	Medical Biophysics	03	45	40 Marks	10 Marks (Tests/ Assignments: 10 Marks)	50	02
	SEC-BP-II	Research Methodology / Medical Diagnostic techniques / *Online course NPTEL /SWAYAM /MOOC*	03	45	25 Marks: (Report:10, Exam:10, Viva:5)	25 Marks (Tests/ Assignments: 15, overall Judgment:10)	50	02
(Annual Practical)	CCBP -P-IV	Lab Course Work (Practical's based on theory papers DSEB-P-IX and - DSEB-P- XI)	03	45	40 Marks	10 Marks	50	02
(Annual Practical)	CCBP -P-V	Lab Course Work (Practical's based on theory papers DSEB-P-IX and - DSEB-P- XI & Visits to National research lab /medical imaging center)	03	45	40 Marks	10 Marks	50	02
Total for B.Sc. III Year: Sem. V + Sem. VI + Lab Course work (Annual)							400	16

Swami Ramanand Teerth Marathwada University, Nanded

B.Sc. Biophysics Third Year (Semester-V) (CBCS) Syllabus

Paper DSEBP -IX: Radiation Biophysics

Learning objectives:

- To understand the theoretical and practical knowledge in radiation biology and biophysics
- To elucidate the effects of radiations on cellular, organ, system
- To study the effects of time, dose and fractionation on long term side effects and treatment effectiveness.
- To study the application and safety measure associated with radiation in real-time application.

Unit 1: Basics of Radiation Biophysics

Atomic structure models, Constituents of atomic nuclei, Isotopes, Isobars, Isotones, Radioactivity, law of Radioactivity, General properties of alpha, beta and gamma radiations, Radiation measurement units, Interaction of radiation with matter: Excitation and ionization, Photo electric effect, Compton Effect, pair production. Non-ionizing radiations-UV, IR, Microwaves & Radio waves, their characteristics, interactions & implications in bio systems.

Unit 2: Basics of Radiochemistry

Radiolysis of water, Production of free radicals and their interactions, Direct and indirect effects of radiation. Radiation chemical yield and G value, Target theory, Single hit & Multi hit theory, Effect of radiation on Nucleic acids, Proteins, Enzymes.

Unit 3: Basics of Radiobiology

Action of radiation on living system – Viruses, Prokaryotic & Eukaryotic cells Cellular effects of radiation, somatic & genetic effects, Inhibition of Mitosis, survival curves, concept of **LD50,** acute and chronic (whole body) effects of radiation, Radiation syndrome in human beings. Radiation Detection & Measurement

Unit 4: Radioisotopes in biology,

Basic Principles of Radiation protection, Maximum permissible dose (MPD). Applications in Medicine (Therapy & diagnosis), Agriculture & plant physiology, Biological applications of radioisotope: Radio-labeling & Tracer techniques, Food irradiation, radiation sterilization of medical product. **Autoradiography -** Principle procedure and Application of autoradiography.

Learning Outcomes:

- The students will understand effect of various radiations on chemical and molecular processes that occur in and between cells.
- The students will able to analyze the impact of radiation of living systems based on methods used to expand our understanding of radiation biology
- The students will be able to handle radioactive markers and radioactive sources with the required precaution.

Reference Books:

1. Introduction to Experimental Nuclear Physics: R.M. Singru.
2. Radiation Biophysics: E.L. Alpen.
3. Nuclear Structure: Preston and Bhaduri.

4. Radiation Detection and Measurement: G.F. Knoll.
5. Edward L. Alpen Radiation Biophysics, Second Edition
6. Biophysics by Glaser Rowland (2001). Springer Verlag, Berlin
7. Bushong, Stewart, Radiologic Science for Technologists, C. V. Mosby, 2009,9th edition.
8. NCRP Report 105. Radiation Protection for Medical & Allied Health Personnel.
9. NCRP Report 116. Limitation of Exposure to Ionizing Radiation.
10. NCRP Report 102. Medical X-ray, Electron Beam, and Gamma-Ray Protection.

Swami Ramanand Teerth Marathwada University, Nanded

B.Sc. Biophysics Third Year (Semester-V) (CBCS) Syllabus

Paper DSEBP-X: Bioinformatics & Structural Biology

Learning objectives:

- To understand the basics concept of biological databases and tools used in bioinformatics studies.
- To analyze, implement and evaluate computer-based systems for phylogenetic and sequence analyses.
- To analyze and evaluate bioinformatics data to discover patterns and generate predictions for proteins and other molecules for structural elucidation, molecular modelling and drug discovery.

Unit 1: Introduction to Bioinformatics

Bioinformatics-Definition aims and tasks of bioinformatics, applications of bioinformatics, **Data bases** – Major Bioinformatics Resources: Nucleic acid sequence databases: NCBI, EMBL, DDBJ; GenBank; Protein sequence databases: Uniprot-KB: SWISS-PROT, Structure classification database: CATH, SCOP; Genome Databases at NCBI, SANGER ;3D Structure Database - PDB, Chemical Structure database: Pubchem; Gene Expression database: GEO, ExPASy Server.

Unit 2: Genomics and **Phylogenetics**

Genomics: Introduction, why analyze DNA, cDNA libraries and ESTS, PCR, Micro-array technology and its applications. **Sequence Alignment** Goals and type of alignment: Pair wise and multiple sequence alignment, FASTA and BLAST. -Phylogenetics, cladistics and ontology, building phylogenetic trees, Interpreting results. Molecular approaches to phylogeny, Phylogenetic analysis databases.

Unit 3: Structural Biology

Conformational principles Biological macromolecules: Protein and Nucleic acid, rotation angles, hydrogen bonding, hydrophobic interactions and water structures; ionic interactions, disulphide bonds, Ramachandran plot, Protein folding and flexibility. Supra-molecular interactions: Protein-protein and protein-nucleic acid interactions.

Unit 4: Bioinformatics in Drug Designing

Molecular Modeling: Introduction, method, homology modeling, energy minimization, molecular visualization tool (RASMOL, PyMOL), R**ole o**f bioinformatics in drug discovery target and lead compounds identification and validation, pharmacoinformatics, chemical libraries, docking and prediction of drug quality. Bioinformatics companies.

Learning outcomes:

- The students will be able to understand the concepts with emphases on the bioinformatics databases
- The students will be able to Design, implement and evaluate computer-based systems, processes, components or programs in relation to the contexts of molecular and cellular biology and genomics research.
- The students will be able to Analyze and evaluate bioinformatics data.
- The students will be able to understand basic of structural bioinformatics, molecular modelling and, drug discovery.

References

1. Basic Bioinformatics by S. Ignacimuthu, S. J. Narosa Publishing House,2005.
2. Bioinformatics: Sequence and Genome analysis by David W. Mount, Cold Spring Harbour Laboratory Press, 2001.
3. Protein structure, stability and folding (2001) K.P.Murphy Humana press.
4. Introduction to protein architechcture (2001) Arthur M.Lesk Oxford University Press.
5. Introduction to Macromolecular Crystallography (2003) McPherson John wiley Publications.
6. Introduction to Protein Structure, (1991) Carl Branden and John Tooze
7. Bioinformatics (2006) N.Gautham John Garland, Publication Inc Narosa publications.
8. Biophysics (2002) Vasantha Pattabhai and N.Gautham Narosa Publishers.
9. Physical Chemistry (2001):Tinoco, I., Jr., Sauer, K., Wang, J. C., & Puglisi, J. D.
10. Principles and Applications in Biological Sciences, 4th ed. Prentice Hall.
11. Introduction to Protein Structure, by Branden and Tooze

Swami Ramanand Teerth Marathwada University, Nanded
Syllabus B. Sc. Biophysics Third Year (Semester-V)
SECBP-I [A/B]
SECBP-I [A] English Communication (Credits : 02)

Theory Workload: 03hrs/wk. **Total Hours: 45 Hrs.**

Learning objective:

- To understand and apply knowledge of human communication and language processes as they occur across various contexts
- To students will be able to explain major theoretical frameworks, constructs, and concepts for the study of communication and language.
- To find, use, evaluate, communicate effectively orally and in writing in academics

Unit 1: Introduction: Language of Communication (16 hrs)
Theory of communication, Types and modes of Communication, Verbal & Non-verbal (Spoken & Written) Personal, Social and Business Barriers and Strategies, Intrapersonal, and Group communication.

Unit 2 : Speaking Skills : (10 hrs)
Monologue, Dialogue, Group Discussion, Effective Communication/ Mis-Communication, Interview, Public Speech

Unit 3 : Reading and Understanding (09 hrs)
Close Reading Comprehension, Summary, Paraphrasing Analysis and Interpretation, Translation(from Indian language to English and vice-versa), Literacy/ knowledge Texts.

Unit 4 : Writing Skills (10 hrs)
Documenting, Report Writing, Making notes, Letter writing

Learning outcomes:

- Students will be able to understand interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication, technologically mediated communication,
- Students will be able to understand and evaluate key theoretical approaches used in the interdisciplinary field of communication.
- Students will be able develop knowledge, skills, and judgment in English communication to facilitate their ability to work effectively orally and in writing.

Recommended readings:

1. Fluency in English – Part II, Oxford University Press,2006.
2. Business English, Person, 2008
3. Language, Literature and Creativity, Orient Blackswan,2013
4. Language through Literature (Forthcoming)ed. Dr. Gauri Mishra, Dr, Ranjana Kaul, Dr. Brati Biswas

SECBP-I[B] Enzyme Immobilization techniques (Credit 02)

Theory Workload: 03 Hrs/wk. **Total hrs: 45 Hrs**

Learning objective:

- To learn the enzyme immobilization; methods of immobilizing the enzymes and their applications
- To learn the enzyme kinetics and the problems related to it
- To learn the factors involving and factors affecting the immobilized enzyme activity

Unit 1. Fundamentals & Methods (18 hrs)

Immobilization of Enzymes, Reversible immobilization: a. Adsorption (Hydrophobic Adsorption, Ionic Exchange Adsorption), Irreversible immobilization: a. Covalent coupling, b. Entrapment and microencapsulation, c. Crosslinking

Unit 2. Matrix or Solid support used in immobilization (09 hrs)

a. Surface-Bound Enzymes, Biopolymers: Synthetic organic polymers: Hydrogels: Inorganic solids: b. Entrapment: Acrylamide, agar, chitin, alginate, and several other polymerizable molecules

Unit 3. Properties of immobilized enzymes (09 hrs)

Optimum pH, Optimum Temperature, Optimum Temperature, Stability: Smart Polymer

Unit 4. Applications of enzyme immobilization (09 hrs)

Agriculture, Industry (Food Detergent textile), Environmental issues, biomedical application,

Learning outcomes:

- Student will learn the fundamental knowledge on enzyme immobilization; methods of immobilizing the enzymes and their applications
- Student will understand the enzyme kinetics, factors involving and factors affecting immobilized enzymes and the problems related to it
- Student will learn the application of the immobilized enzyme.

- Benaglia, Maurizio; Puglisi, Alessandra, 2020, Catalyst immobilization: methods and applications, Wiley-VCH.
- Shelley D. Minteer (eds.), 2017, Methods in Molecular Biology 1504- Enzyme Stabilization and Immobilization: Methods and Protocols [2 ed.], Humana Press.
- Alka Dwevedi (auth.)2016, Enzyme Immobilization: Advances in Industry, Agriculture, Medicine, and the Environment [1 ed.] Springer International Publishing.
- Jose M. Guisan (eds.) 2006, Methods in Biotechnology 22, Immobilization of Enzymes and Cells [2 ed.] Humana Press.

Swami Ramanand Teerth Marathwada University, Nanded

B.Sc. Biophysics Third Year (Semester-VI) (CBCS) Syllabus

Paper DSEBP-XI: Immunology

Learning objective:

- To understand the overview of immune system including cells, organs and receptors.
- To learn structure and functions of different classes of immunoglobulins, the basis of antibody diversity and the importance of humoral, cell-mediated and innate immune responses in combating pathogens.
- To get acquainted with the importance of antigen-antibody interaction in disease diagnosis and various immunotechniques.

Unit 1: Introduction to Immunology.

Concept and principles of immune system, origin of immune system in invertebrates and Vertebrates, Innate immunity, Barriers of innate immunity, Anatomical, physiological and chemical barriers, Adaptive Immunity, active and passive immune system. Molecules, Cells and tissues of immune system.

Unit 2: Cells and Organs of the Immune System:

The lymphatic system, Hematopoiesis, Hematopoietic growth factors, Primary lymphoid organs: Thymus, Bone marrow and Bursa of fabricius Secondary lymphoid organs: Thymus, Lymph nodes, Spleen, tonsils, Payer's patches, Mucosa associated lymphoid tissues B-lymphocytes, T-lymphocytes, NK cells, Granulocytes etc.

Unit 3: Antigen-Antibody & their interaction

Concepts of antigen, Antigenic determinant, Antigenicity, Immunogen and Immunogenicity, Factors affecting Antigenicity, Exogenous antigens, Endogenous antigen, Alloantigen, Hapten, Carrier effect, Cross reactivity.

Immunoglobulin: Structure of Immunoglobulin, Classes and subclasses of Immunoglobulins, function of different Immunoglobulins, Immunoglobulin diversity. Physico-chemical basis of Ag-Ab interaction, Avidity, strength of binding between Ag and Ab and its measurement.

Unit 4: Immunotechniques

Detection of Ag-Ab interaction, Precipitation, Agglutination and Complement fixation, Concept of Monoclonal and polyclonal Antibodies, Immunization, Antibody assays : Precipitation reaction in gel and solutions, Double, Single, Radial immunoprecipitation, Prozone effect, Haemagglutination, Bacterial agglutination, Coomb's test, Complement fixation test, Immunoelectrophoresis, Radioimmunoassay, ELISA.

Learning outcomes:

- Student will learn the fundamental knowledge on enzyme immobilization
- Students will gain an overview of the immune system including cells, organs and receptors.
- Student will understand structure and functions of different classes of immunoglobulins, the antibody diversity and the importance of humoral, cell-mediated and innate immune responses in combating pathogens.

References:

1. Elementary Microbiology Vol.I and II Dr. A.H Modi. Akta Prakashan. Nadiad.
2. Medical Microbiology. N.C.Dey and T.K. Dey. Allied agency, Culcutta.
3. A text book of Immunology. C.V.Rao.,Narosa Publishing House,New Delhi.
4. Molecular biology by David Freidfelder, Narosa Publishing house, New Delhi.
5. Text book of Immunology by B.S.Nagoba and D.V.Vedpathak. BI publications, New Delhi.
6. Text book of Microbiology by R. Anantharayanan, C.K. Jayaram Panikar, Orient Longman,

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B.Sc. Biophysics Third Year (Semester-VI) (CBCS) Syllabus

Paper DSEBP -XII: Medical Biophysics

Learning objective:

- To be familiar with the physical principles and applications of important biophysical techniques.
- To understand basic techniques of signal processing, data analysis, and data fitting when using biophysical or other techniques.
- To learn how to identify basic biophysical and molecular structural questions for treatment of important human diseases.

Unit 1: Basic Electrophysiology:

Nature of bioelectric signal, Fundamental concepts in bioelectricity & bioelectronics, principles & utility of patch-clamp, ELECTROCARDIOGRAPHY (ECG) Fundamental principles of electrocardiography, Electrocardiograph lead systems, The normal P wave and the QRS complex, Ventricular recovery and ST-T wave U wave, Normal variants, Rate and rhythm Principle, instrument design and medical utility of EEG, EMG, ERG, EOG, Visual evoked potentials, biological impedance and its significance.

Unit 2: Medical Imaging:

Physical aspects of medical imaging, Fundamentals of LASER, Applications of Lasers in therapy and diagnosis, Basic Principle: X-ray imaging, Xeroradiography, CT Scan, MRI, Ultrasound in medicinal application and therapeutic safety.

Unit 3: Nuclear Medicine

In-vitro & in-vivo imaging using radioisotopes, isotopic method, Organ scans: thyroid, liver, brain, bone, renal imaging and cardiac imaging. Radioimmunoassay: Principle, method and applications. Nuclear medicine in therapy and Radiopharmaceuticals.

Unit 4: Biomedical Instrumentation

Basic concepts in medical instrumentation, Basic sensors-principles, transducers, amplifiers, Measurement of blood pressure, blood volume, blood flow, respiratory measurements, cardiac Output measurements, patient monitoring equipments, audiometers, cardiac pacemakers, physiotherapy equipments, hemodialysis machine, ICU and Operation theatre equipments, blood bank instrumentation.

Learning outcomes

- Students will demonstrate a core knowledge base in the theory and practice of medical Biophysics.
- Students will function successfully in the laboratory and use safe laboratory practices.
- Students will critically evaluate techniques of signal processing, data analysis, and data fitting when using biophysical or other techniques.

References

1. Beiser A.: Physics, Addison-Wesley, Massachusetts 1991, Chapter 27, pp. 803-807
2. Katzir A.: Lasers and Optical Fibers in Medicine, Academic Press, Inc. 1993
3. Medical Instrumentation applications and design by John G. Webster.
4. Biomedical Instrumentation Technology and applications by Khandpur. Mc Graw –Hill.

5. Biomedical Instrumentation systems by Shakti Chatterjee.
6. R.S.Khandpur, ‘Hand Book of Bio-Medical instrumentation', McGraw Hill Publishing Co Ltd. 2003.
7. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, Biomedical Instrumentation and Measurements, Pearson Education
8. M.Arumugam, ‘Bio-Medical Instrumentation', Anuradha Agencies,
9. L.A. Geddes & L.E.Baker, Principles of Applied Bio-Medical Instrumentation, John Wiley
10. J.Webster, Medical Instrumentation', John Wiley & Sons, 1995.
11. C.Rajarao and S.K. Guha, ‘Principles of Medical Electronics and Bio-medical Ins
12. James Moore George Zouridakis Biomedical Technology and Devices Handbook CRC Press
13. Bronzino Biomedical Engineering Handbook CRC Press
14. Physics of Diagnostic Imaging, Universities press (India) Ltd, Orient Longman ltd, 2000.
15. Goddess & Baker Principles of Applied Biomedical Instrumentation, JohnWiley
16. Carr & Brown Biomedical Instrumentation & Measurement, Pearson.

Swami Ramanand Teerth Marathwada University, Nanded
Syllabus (CBCS) B. Sc. Biophysics Third Year (Semester-V) SECBP-II [A/B]
SECBP-II [A] Research Methodology (CREDITS 2)
Theory Workload: 03 hrs/Wk. Total Hours: 45 Hrs.

Learning objectives

- To identify and discuss the role and importance of research in Sciences.
- To gain knowledge of the complex issues inherent in selecting a research problem, selecting an appropriate research design, and procedures of sampling, data collection, analysis
- To understand the different types of academics report and thesis writings and reporting.

Unit 1: Foundations of Research (10 hrs)

Meaning, Objectives, Motivation: Research Methods vs Methodology, Types of Research: Analytical vs Descriptive, Quantitative vs Qualitative, Basic vs Applied.

Unit 2: Research Design (10 hrs)

Need for research design: Features of good design, Important concepts related to good design- Observation and Facts, Prediction and Explanation, Development of Models. Developing a research plan: Problem identification, Experimentation, Determining experimental and sample designs

Unit 3: Data Collection, Analysis (10 hrs)

Observation and Collection of Data-Methods of data collection- Sampling Methods, Data Processing and Analysis Strategies, Technical Reports and Thesis writing, Preparation of Tables and Bibliography. Data Presentation using digital technology

Unit 4: Report Writing and Ethical Issues (10 hrs)

Technical Reports and Thesis writing, Preparation of Tables and Bibliography. Data Presentation using digital technology. Intellectual property Rights, Commercialization, Copy Right, Royalty, Patent law, Plagiarism, Citation, Acknowledgement.

Learning outcomes

- Students will understand the key research concepts and issues
- Students will read, comprehend, and explain research articles in their academic discipline.
- Students will understand and present different types of academics' report and thesis writings

SUGGESTED READINGS :

1. Anthony, M, Graziano, A.M. and Raulin, M.L. 2009. Research Methods: A Process of Inquiry, Allyn and Bacon. ·
2. Walliman, N. 2011.Research Methods- The Basics. Taylor and Francis, London, New York. · Wadhera, B.L.: Law Relating to Patents, Trade Marks, Copyright Designs and Geographical Indications, 2002, Universal Law publishing ·
3. C.R.Kothari: Research Methodology, New Age International, 2009 ·
4. Coley, S.M. and Scheinberg, C.A. 1990, "Proposal writing". Stage Publications

SECBP-II [B] Medical Diagnostic techniques (CREDITS 2)

Theory Workload: 03 hrs/Wk. Total Hours: 45 Hrs.

Learning objectives

- To understand accurately, efficiently, and comprehensively collect key clinical findings needed to inform diagnostics
- To explain and justify the diagnosis by comparing and contrasting the patient's findings and test results
- To learn the importance of medical reports, infectious diseases, non-infectious diseases, tumors in diagnosis,

Unit 1: Introduction: (11 hrs)

Introduction for the Need of Medical Diagnostics and its Importance, ethics in medical diagnosis, safety measures during diagnostic.

Unit 2: Diagnostics Methods Used for Analysis of Blood (12 hrs)

Blood composition, Preparation of blood smear and CBC using analyzer machine, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.), Routine Urine Analysis.

Unit 3:Non-infectious Diseases (10 hrs)

Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit

Unit 4: Infectious Diseases and Tumors(12 hrs)

Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis, Types of Tumours (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, CT Scan (using photographs).

Learning outcomes

- Students will understand the key clinical findings needed to inform diagnostics
- Students will able to analyse essential epidemiological and clinical information
- Students will understand and present different types of academics' report and thesis writings

SUGGESTED READINGS

1. Park, K. (2007), Preventive and Social Medicine, B.B. Publishers ·
2. Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House ·
3. Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses ·
4. Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders ·
5. Robbins and Cortan, Pathologic Basis of Disease, VIIIEdition, Saunders ·
   Prakash, G. (2012), Lab Manual on Blood Analysis and Med Diagnostics, S. Chand and Co. Ltd.

Swami Ramanand Teerth Marathwada University, Nanded
Syllabus (CBCS) B.Sc. Third Year [Biophysics]
Lab course CCBP-IV

LIST OF PRACTICALS [Based on Radiation Biophysics]

1. To calibrate the UV source using Potassium ferrioxalate actinometry.
2. To measure the UV intensity using UV meter
3. To study the effect of UV, X-rays on mitotic cell division.
4. To study the effect of UV, X-rays on biomolecules – amino acids, proteins, Nucleic acids, enzymes.
5. To study the effect of UV, X-rays on seed germination and study cytogenetic changes
6. To study the effect of UV, X-rays on cell membrane- RBC
7. To study the effect of UV, X-rays on bacterial cell growth and evaluate $\mathbf{LD_{50}}$
8. To investigate background radiation, learn how to measure it, and compensate for it.
9. To study the characteristics of a Geiger-Muller counter and to determine plateau and operating voltage of the GM counter.
10. To determine the resolving time of a GM counter.
11. To estimate the efficiency of the Geiger-Mueller tube for a particular source.
12. To demonstrate the Statistical Nature of Radiation Counting & investigate the statistics related to measurements with a Geiger counter.
13. To investigate the relationship between the distance and intensity of radiation and verify the inverse square relationship between the distance and intensity of radiation.
14. To investigate the relationship between absorber material (atomic number) and backscattering and study the relationship between absorber thickness and backscattering.
15. To determine the range of an α particle in air, and consequently the alpha particle's energy.
16. To investigate the attenuation of radiation via the absorption of beta particles.
17. To determine the maximum energy of decay of a beta particle.
18. To investigate the attenuation of radiation via the absorption of gamma rays.
19. Visit to National research lab/ Radiotherapy Center.

LIST OF PRACTICALS [Based on IMMUNOLOGY]

1. Demonstration of Immunization of Rabbit
2. To perform immunodiffusion by Ouchterlony method.
3. Single radial immunodiffusion(Mancini method)
4. Analysis of the Ouchterlony and Mancini method
5. Counter-current Immunoelectrophoresis
6. Characterization of the Blood Group by agglutination
7. To perform ELISA checkerboard experiment.
8. To perform Complement fixation assay
9. To perform Immuno affinity chromatography.
10. To perform Agglutination inhibition Assay
11. To perform sandwich ELISA.
12. To perform Immunoprecipitation
13. To perform Coomb's test.
14. Hemolytic plaque assays.
15. Antigen-Antibody Assay.
16. Antigen-Antibody testing method.

Swami Ramanand Teerth Marathwada University, Nanded
Syllabus (CBCS) B.Sc. Third Year [Biophysics]
Practical Course Paper CCB-P-XV

LIST OF PRACTICALS [Based on Bioinformatics & structural biology]

1. Searching of scientific information in NCBI, EBI, DDBJ, ENTREZ.
2. Surveying Primary, Derived, specialized & structural biological databases & compiling information.
3. Identification of gene using gene scan & EST analysis.
4. Primer designing using software.
5. Pair wise alignment BLAST & FASTA.
6. Multiple sequence alignment CLUSTAL-W.
7. Prediction of primary and secondary structure and various parameters in protein structure and function.
8. 3D analysis of protein molecule & molecular visualization using RASMOL,Cn3D.
9. Phylogenetic analysis using PHYLIP or other software.
10. Molecular Docking using AUTODOCK or other software.
11. Access to ExPASy server.
12. Access to Swiss-Prot.
13. Access to Uniprot.
14. Access and perform docking with SWISSDOCK.

LIST OF PRACTICALS [Based on Medical Biophysics]

1. Identification of different block/sub system of circuits in X-Ray machine
2. Operation and function of all the controls of hospital X-Ray machine (visit to hospital)
3. Operation and function of all the controls of dental X-Ray machine (Visit to Hospital)
4. Observe its wave shape on CRO the output of blood pressure transducers, body Temperature transducers and pulse sensors
5. Measurements of B.P. and recording of Kortov sound
6. Measurements of body temperature using GSR and thermistor probe
7. Measurements of skin resistance using GSR
8. Use of sphygmomanometer for measurement of blood pressure
9. To determine respiratory parameters using Spirometry (PFT).
10. Concept of ECG system and placement of electrodes
11. Measurement of leakage currents with the help of safety tester
12. To study EMG system and placement of electrode
13. To study EEG system and placement of electrode
14. To study ophthalmologic instruments
15. Identification of different types of pH electrode
16. Visit to hospital and demonstration of biomedical equipments in ICU, ICCU & operation theater
17. Basic electronic experiments- transistor, semiconductor diode characteristics, rectifier, operational amplifiers, use of CRO etc.
18. To perform computer-based Lab Tutor experiments using Power Lab instrumentation (AD-Instruments, Australia)
19. Visit to Medical Imaging centres and demonstration of CT Scan, MRI, Ultrasonography, Angiography.