



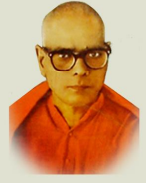
स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ

नांदेड— ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

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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परिपत्रक

सर्व संबंधितांना या परिपत्रकान्वये कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या विज्ञान व तंत्रज्ञान विद्याशाखेंगत राबविण्यात येणारा B.Sc. Biophysics Third Year CBCS Pattern चा सोबत जोडल्याप्रमाणे अभ्यासक्रमास शैक्षणिक वर्ष २०१८—१९ पासून लागू करण्यासाठी मा. कुलगुरू यांनी विद्यापरीषदेच्या वतिने मान्यता प्रदान केली आहे.

तरी उपरोक्त प्रमाणे ही बाब सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

“ज्ञानतीर्थ” परिसर) (
विष्णुपूरी, नांदेड.) (स्वा/—
जा.क्र.शै.०१/Syllabus/२०१८—१९/१२३४) (उपकुलसचिव
दिनांक : ०४/०९/२०१८) (शैक्षणिक (अभ्यासमंडळे) विभाग,
) (

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) प्राचार्य, सर्व संबंधित महाविद्यालये, प्रस्तुत विद्यापीठ.
- २) संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
- ३) कुलसचिव, (निवडणूक व सभा कक्ष) यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ४) उपकुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
- ५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
- ६) सिस्टीम एक्सपर्ट, प्रस्तुत विद्यापीठ. (सदरील परिपत्रक व अभ्यासक्रम विद्यापीठाच्या संकेतस्थळावर प्रसारित करावे.)

**Swami Ramanand Teerth Marathwada University
Nanded.**

FACULTY OF SCIENCE

**SYLLABUS
(CBCS Pattern)**

B.Sc. Biophysics Third Year

SEMESTER V & VI

[Syllabus progressively effective from 2018-19 onwards]

Swami Ramanand Teerth Marathwada University, Nanded
CBCS Pattern Syllabus for B.Sc. Biophysics Third Year Semester V & VI
 (Effective from 2018-19)

Sem.	Code & Paper Code	Section & Period/week	Title of the paper	External (ESE)	Internal (CA)	Credits
V	DSEBP-XII	03	Immunology	40 Marks	10 Marks (Tests/Assignments: 10 Marks)	02
	DSEBP -XIII	03	Bioinformatics & Structural Biology	40 Marks	10 Marks (Tests/Assignments: 10 Marks)	02
	SECBP-I [A/B]	A/B/03	English Communication/ Instrumentation and Techniques	25 Marks: (Report:10,Exam:10,Viva:5)	25 Marks (Tests/Assignments: 15, overall Judgment:10)	02
VI	DSEBP -XIV	03	Radiation Biophysics	40 Marks	10 Marks (Tests/Assignments: 10 Marks)	02
	DSEBP -XV	03	Medical Biophysics	40 Marks	10 Marks (Tests/Assignments: 10 Marks)	02
	SECBP-II [A/B]	A/B/03	Research Methodology /Medical Diagnostic techniques	25 Marks: (Report:10,Exam:10,Viva:5)	25 Marks (Tests/Assignments: 15, overall Judgment:10)	02
Lab Course Work (Annual Practical)	CCBPP-XVI	--	Practical's based on theory papers CCBP-XII & XIII	50 Marks	-----	02
Lab Course Work (Annual Practical)	CCBPP-XVII	--	Practical's based on theory papers CCBP- XIV & XV	2 50 Marks	-----	02
Total for B.Sc. III Year: Sem. V + Sem. VI + Lab Course work (Annual)						16

Swami Ramanand Teerth Marathwada University, Nanded

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

Paper DSEBP-XII: Immunology

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, Haematopoiesis, Haematopoietic growth factors, Primary lymphoid organs: Thymus, Bone marrow and Bursa of fabricius Secondary lymphoid organs: Thymus, Lymphnodes, Spleen, tonsils ,Payerø 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, Exogeous 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, The complement system, Cytokines Concept of Monoclonal and polyclonal Antibodies, Immunization, Methods for purification of antibodies, Antibody assays : Precipitation reaction in gel and solutions Double, Single, Radial immunoprecipitation, Agglutination reactions, Prozone

effect, Haemagglutination, Bacterial agglutination , Passive agglutination , Coombs test, Complement fixation test, Immunoelectrophoresis, Radioimmunoassay, ELISA

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,

Swami Ramanand Teerth Marathwada University, Nanded
Syllabus (CBCS) B. Sc. Biophysics Third Year (Semester-V)
Paper DSEBP -XIII: Bioinformatics & Structural Biology

Unit 1: Bioinformatics I

Bioinformatics-Definition aims and tasks of bioinformatics, applications of bioinformatics, intrinsic & extrinsic views in bioinformatics.

Data bases ó Major Bioinformatics Resources:Nucleic acid sequence databases: NCBI ,EMBL, DDBJ; GenBank; Protein sequence databases: Uniprot-KB: SWISS-PROT, TrEMBL, Derived Structure classification database: CATH,SCOP; Genome Databases at NCBI, SANGER ;3D Structure Database - PDB, Chemical Structure database: Pubchem; Gene Expression database: GEO, SAGE. ExPASy.

Genomics: DNA Sequence Analysis-Introduction, why analyze DNA , gene structure and DNA sequences, feature of DNA sequence analysis, expression profile of a cell, cDNA libraries, and ESTS, different approaches to EST analysis, Micro-array technology and its applications.

Unit 2: Bioinformatics II

Phylogenetic Analysis-Phylogenetics, cladistics and ontology, building phylogenetic trees, Distance based methods and character based methods, molecular approaches to phylogeny,

phylogenetic analysis databases.

Sequence Alignment-Algorithm, goals and type of alignment, pair wise database searching, FASTA, BLAST, multiple sequence alignment, Detecting Open Reading Frames, Mutation Matrices, Interpreting results.

Unit 3: Structural Biology

Levels of structures in Biological macromolecules, Basic structural & conformational principles, Protein and Nucleic acid structure, rotation angles, hydrogen bonding, hydrophobic interactions and water structures; ionic interactions, disulphide bonds, Ramachandran plot, Folding and flexibility, Types of proteins and Interactions that govern protein folding, folding mechanisms, Prediction, engineering and design of protein structures. Supra-molecular interactions, Functional importance of Protein-protein and protein-nucleic acid interactions.

Unit 4: Structural Bioinformatics

Molecular Modeling : Predictive methods using DNA and Protein Sequences, Gene-prediction and Proteins-prediction strategies, Methods for Prediction of Structure, homology modeling, comparative modeling, threading, energy minimization , molecular visualization, Comparative modeling, Molecularvisualization-protein conformation and visualization tool (RASMOL), Structures of oligomeric proteins and study of interaction interfaces.

Drug Discovery and Pharmaco-informatics-Drug discovery -role of bioinformatics in drug discovery target identification and validation, identification the lead compounds, optimization of lead compounds, pharmacoinformatics, chemical libraries, search programming docking and prediction of drug quality. Bioinformatics companies.

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 architecture (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

Practical References:

1. Introduction to Bioinformatics by S. Sundara Rajan and R. Balaji. Himalaya Publishing
2. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins by Andreas D.
3. Baxevanis and B. F. Francis Ouellette, 2nd Edition, John Wiley & Sons, 2002.
4. Bioinformatics: Sequence, Structure and Databanks by Des Higgins and Willie Taylor. Oxford University Press, 2000.
5. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids by
6. Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison, Cambridge Univ P
7. Proteins: structures and molecular properties Thomas E. Creighton
8. Chemoinformatics Edited by Johann Gasteiger and Thomas Engel
9. Structural Bioinformatics, Edited Philip E. Bourne and Helge Weissig
10. Computer Science, J.G. Brookshear, Pearson, Addison Wesley
11. Introduction to Bioinformatics ó T. Attwood, Parry Smith.
13. Bioinformatics ó Managing Scientific Data, Zoe ø Lacroix and Terence Critchlow.
14. Bioinformatics ó Sequence, Structure and Databanks, Des Higgins & Willie Taylor
15. Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003
16. Statistical Methods in Bioinformatics: An Introduction, G.R. Grant, W.J. Ewens, Springer

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

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. Countercurrent 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 Coombs test.
14. Hemolytic plaque assays.

LIST OF PRACTICALS [Based on BIOINFORMATICS & STRUCTURAL BIOLOGY]

1. Searching of scientific information in NCBI, EBI,DDBJ using Entrez, SRS
2. Surveying Primary, Derived, specialized & structural biological databases & compiling information
3. identification of gene using gene scan & EST analysis
4. Primer designing using softwares
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.

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 : 03 hrs/Wk.

Total Hours : 45 Hrs.

Unit 1 : Introduction : (08 hrs)

Theory of communication , Types and modes of Communication

Unit 2 : Language of Communication (08 hrs)

Verbal & Non-verbal (Spoken & Written) Personal, Social and Business Barriers and Strategies ,Intrapersonal, and Group communication.

Unit 3 : Speaking Skills : (10 hrs)

Monologue, Dialogue, Group Discussion, Effective Communication/ Mis-Communication, Interview, Public Speech

Unit 4 : Reading and Understanding (09 hrs)

Close Reading Comprehension, Summary, Paraphrasing Analysis and Interpretation , Translation(from Indian language to English and vice-versa), Literacy/ knowledge Taxis.

Unit 5 : Writing Skills (10 hrs)

Documenting , Report Writing ,Making notes, Letter writing

Recommended readings :

1. Fluency in English ó Part II, Oxford University Press,2006.
2. Buisness English, Person, 2008
3. Language, Literature and Creativity , Orient Blackswan,2013

4. Language through Literature (Fourthcoming)ed. Dr.Gauri Mishra,Dr, Ranjana Kaul, Dr.Brati Biswas

SECBP-I[B] Instrumentation and Techniques (Credit 02)

Theory Workload: 03 Hrs/wk.

Total hrs: 45 Hrs

Unit 1: Distillation of Water: (03hrs)

Chemistry of water, physical properties, the process of Distillation

Unit 2: Sterilization Techniques: (08 hrs)

Heat sterilization: Autoclave, Oven, Filter sterilization, UV Sterilization

Unit 3 : Preparation of Solutions : (10 hrs)

Use of balances & pH meter, Nature of acids and bases, strong and weak acids, dissociation constant, pKa of an acid & its determination , concept of buffers, Buffering capacity, preparation of buffer, measurement of pH, working of a pH meter

Unit 4: Microscopy & Spectrophotometer : (12 hrs)

Principles & applications of Simple, compound & Florescence Microscopes Principles of absorption spectroscopy, UV- Visible absorption spectroscopy, Lambert ϵ - Beer ϵ law, Working of Spectrofluorimetric, principle of fluorescence, intrinsic & extrinsic fluorescence , uses of intrinsic & extrinsic fluors in biology.

Unit 5: Centrifuge, Chromatography & Seperation Techniques : (12 hrs)

Principle of centrifugation, basic rules of sedimentation coefficient, various types of centrifuges ó Table Top centrifuge, refrigerated centrifuge , ultracentrifuge, different types of rotors, differential centrifugation , density gradient centrifugation. Basic principles of Chromatography, modes of chromatography, TLC, Paper, Colomn, Gel filtration, ion exchange, Affinity Chromatography ,Dialysis, Electrophoresis,Agarose Gel Electrophoresis, PAGE: SDS & native, IEF, detection of nucleic acids & proteins.

Swami Ramanand Teerth Marathwada University, Nanded
Syllabus (CBCS) B. Sc. Biophysics Third Year (Semester-VI)
Paper DSEBP -XIV: Radiation Biophysics

Unit 1: Basics of Radiation Physics

Atomic structure models, Constituents of atomic nuclei, Isotopes, Isobars, Isotones, Radioactivity, law of Radioactivity, General properties of alpha, beta and gamma radiations, Radiation units: Units of measurement of radioactivity. Curie, Becquerel. Units of exposure, Roentgen, Rad, Gray, relative biological effectiveness, Interaction of radiation with matter: Excitation and ionization, Photo electric effect, Compton Effect, pair production, Characteristic radiation. Properties, Characteristics X-rays , Interaction with different biosystems, Nonionizing radiations-UV, IR, Microwaves & Radio waves, their characteristics, interactions & implications in bio systems.

Unit 2: Basics of Radiochemistry and Radiobiology

Radiolysis of water, Production of free radicals & 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, 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.

Unit 3: Radiation Detection & Measurement

Radiation sources, Tele-gamma Unit (Cobalt unit), Gamma chamber, Nuclear reactors, gamma camera, Principles of radiation detection and measurement, General principles of Dosimeters., Basic principle, design and utility of ionization chamber, proportional counter, GM-counter, Scintillation Detectors. Thermo-luminescent dosimeter, chemical dosimeter-Fricke, Free radical dosimeters.

Unit 4: Radiation Safety measures and Application

Natural & Man-made radiation exposures, Basic Principles of Radiation protection concept of Maximum permissible dose (MPD) personal and area monitoring, legal aspect of radiation protection, Disposal of radioactive waste.

Radioisotopes in biology, Medicine(Therapy & diagnosis),Agriculture, Plant breeding, Soil plant relationship & plant physiology, Biological applications of radioisotope, Radio-labeling & Tracer

techniques, Food irradiation, radiation sterilization of medical product. **Autoradiography**-Principle procedure and Application of autoradiography.

Reference Books:

1. Primer in Applied Radiation Physics: F.A. Smith.
2. Introduction to Experimental Nuclear Physics: R.M. Singru.
3. Radiation Biophysics: E.L. Alpen.
4. Atom, Radiation and Radiation Protection: J. Turner.
5. Atomic and Nuclear Physics Vol. II: Ghoshal.
6. Nuclear Structure: Preston and Bhaduri.
7. Nucleon-nucleon Interaction: Brown and Jackson.
8. Introductory Nuclear Physics: S.S.M. Wong.
9. Nuclear Structure: M.K.Pal
10. Radiation Detection and Measurement: G.F. Knoll.
11. Nuclear Physics Techniques: W.R. Leo.
12. Introduction to Nuclear and Particle Physics(2nd Edition): A Das and T. Ferbel.
13. Radiation Biophysics by L.Alpen Edward, Academic Press, (1988).
14. Biophysicsô An Introduction. John Wiley and Son, (2002).
15. Yurii B. Kudryashov Radiation Biophysics (Ionizing Radiations)
16. Edward L. Alpen Radiation Biophysics, Second Edition
17. Biophysics by Glaser Rowland (2001). Springer Verlag, Berlin
18. Bushong, Stewart, Radiologic Science for Technologists, C. V. Mosby, 2009,9th edition.
19. NCRP Report 105. Radiation Protection for Medical & Allied Health Personnel.

20. NCRP Report 116. Limitation of Exposure to Ionizing Radiation.

21. NCRP Report 102. Medical X-ray, Electron Beam, and Gamma-Ray Protection.

Swami Ramanand Teerth Marathwada University, Nanded
Syllabus (CBCS) B. Sc. Biophysics Third Year (Semester-VI)
Paper DSEBP -XV: Medical Biophysics

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 (Carbon Dioxide Laser, Nd:YAG Laser, Applications of Lasers in therapy and diagnosis, photo-thermal effects, photochemical effects, Principle, procedure and medical utility of X-ray imaging, Xeroradiography, Fluoroscopy, Computer Tomography Scan, MRI, Ultrasound in medicine- Ultrasound interactions with the tissues (reflection, diffraction, refraction, absorption, attenuation, scattering, stationary waves Ultrasound application in medicine and safety of diagnostic and therapeutic ultrasound.

Unit 3: Nuclear Medicine

In-vitro & in-vivo imaging using radioisotopes, Blood volume determinations by isotopic method, Radioiodine diagnosis & therapy in thyroid disorders, Principle, method and applications of Radioimmunoassay, organ scans-thyroid, liver, brain, bone, renal imaging, cardiac imaging, PET scan, SPECT scan, nuclear medicine for therapy, radiopharmaceuticals-concept, production and use.

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, surgical diathermy, physiotherapy equipments, hemo dialysis machine, automated drug delivery systems, ICU and Operation theatre equipments, blood bank instrumentation.

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 óHill.
5. Biomedical Instrumentation systems by Shakti Chatterjee.
6. R.S.Khandpur, -Hand Book of Bio-Medical instrumentationø 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 Instrumentationø Anuradha Agencies,
9. L.A. Geddes & L.E.Baker, Principles of Applied Bio-Medical Instrumentation, John Wiley
10. J.Webster, Medical Instrumentationø John Wiley & Sons, 1995.
11. C.Rajaroo 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. Third Year [Biophysics]
Practical Course Paper CCBP-XVII

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 ó 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 **LD₅₀**
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 alpha 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.

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 thermister 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.

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.

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 (05 hrs)

Technical Reports and Thesis writing, Preparation of Tables and Bibliography. Data Presentation using digital technology

Unit 4: Ethical Issues (05 hrs)

Intellectual property Rights, Commercialization, Copy Right, Royalty, Patent law, Plagiarism, Citation, Acknowledgement

SUGGESTED READINGS :

- Anthony, M, Graziano, A.M. and Raulin, M.L. 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
- Walliman, N. 2011. Research Methods- The Basics. Taylor and Francis, London, New York.
- Wadhwa, B.L.: Law Relating to Patents, Trade Marks, Copyright Designs and Geographical Indications, 2002, Universal Law publishing
- C.R.Kothari: Research Methodology, New Age International, 2009
- 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.

Unit 1: Introduction : (05 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 Differential Leucocyte Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)

Unit 3: Diagnostic Methods Used for Urine : (06 hrs)

Routine Urine Analysis: Physical characteristics; Abnormal constituents , predictions

Unit 4: 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 5: Infectious Diseases (12 hrs)

Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis Unit 6: Tumours 3 Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT Scan (using photographs).

SUGGESTED READINGS

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