**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,**
**CHHATRAPATI SAMBHAJINAGAR.**

## CIRCULAR NO.SU/ Sci./College/NEP-2020/104/2024

It is hereby inform to all concerned that, In continuation circular No.SU./Revised B.Sc./NEP/72/2024/25588-96 dated 29.04.2024, the revised syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technolgy, the Academic Council at its meeting held on 08 April 2024 has accepted **the following Revised B.Sc. Course Structure & Curriculum** as per direction by the State Government dated on 13 March 2024 under the Faculty of Science & Technology (as per National Education Policy – 2020) run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

| Sr.No. | Courses | Semester |
|---|---|---|
| 1 | Physics | Ist and IInd semester |
| 2 | Instrumentation Practice | Ist and IInd semester |
| 3 | Electronics | Ist and IInd semester |
| 4 | Mathematics | Ist and IInd semester |
| 5 | Industrial Chemistry | Ist and IInd semester |
| 6 | Agrochemical Fertilizer | Ist and IInd semester |
| 7 | Horticulture | Ist and IInd semester |
| 8 | Biochemistry | Ist and IInd semester |
| 9 | Botany | Ist and IInd semester |
| 10 | Zoology | Ist and IInd semester |
| 11 | Biotechnology | Ist and IInd semester |
| 12 | bioinformatics | Ist and IInd semester |
| 13 | Microbiology | Ist and IInd semester |
| 14 | Dairy Science & TEchnology | Ist and IInd semester |
| 15 | Statistics | Ist and IInd semester |
| 16 | computer Science | Ist and IInd semester |
| 17 | Geology | Ist and IInd semester |
| 18 | Chemistry | Ist and IInd semester |
| 19 | Analytical Chemistry | Ist and IInd semester |
| 20. | Polymer Chemistry | Ist and IInd semester |
| 21. | Environmental Science | Ist and IInd semester |
| 22. | Fishery Science | Ist and IInd semester |

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This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar
-431 004.
REF.NO. SU/SCI./2024/27128-35
Date:-27.05.2024.

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**Deputy Registrar,**
**Academic Section.**

**Copy forwarded with compliments to :-**

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

**Copy to :-**

**1]** The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

**Dr.BabasahebAmbedkarMarathwadaUniversity**

**Chhatrapati Sambhajinagar- 431001**

**B.Sc.DegreeProgramme**

**(ThreeYear/FourYears (Hons)/FourYears (Honswith Research)**

# Course Structure and syllabus for B. Sc. First Year

**(Revised)**

**(ASPERNEP-2020)**

**Subject(Major):Biochemistry**

**Effectivefrom2024-25**

# PREFACE

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Science (B. Sc.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric,multidisciplinary,andgearedtowardsfosteringcreativity,criticalthinking,and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditionalsilostoencourageholisticunderstandingandapplicationofconcepts.TheBachelor ofScience(B.Sc.)curriculumembodiestheseprinciplesbyofferingadiversearrayofcourses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore,thecurriculumisdesignedtopromoteexperientiallearning,research,andhands- on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Science (B. Sc.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment.Byintegratingcoursesonethics,sustainability,andsocialsciences,theBachelor of Science (B. Sc.) program aims to produce graduates who are not only proficient in their respectivefieldsbutalsocompassionate,ethicalleaderscommittedtomakingapositiveimpact on the world.

AsweembarkonthisjourneyofeducationaltransformationguidedbytheNationalEducation Policy2020,theBachelorofScience(B.Sc.)curriculumstandsasatestamenttoourcollective vision of a more equitable, inclusive, and enlightened society. It is our hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potentialandcontributemeaningfullytotheadvancementofknowledgeandthebettermentof humanity.

## ProgrammeEducationalObjectives(PEOs):

ProgrammeEducationalObjectives(PEOs)fortheBachelorofScienceCurriculumunderthe National Education Policy 2020:

1. **Mastery of Discipline-Specific Knowledge**: Graduates of the Bachelor of Science program will demonstrate a deep understanding of fundamental principles, theories, and methodologies in their chosen scientific discipline, enabling them to analyze complex problems, propose innovative solutions, and contribute to advancements in their field.

2. **InterdisciplinaryProficiency**:Graduateswillpossesstheabilitytointegrateknowledge and skills from multiple scientific disciplines, fostering a holistic approach to problem-solving and innovation. They will be equipped to address multifaceted challenges by drawing upon diverse perspectives and methodologies.

3. **CriticalThinkingandAnalyticalSkills:**Graduateswilldevelopstrongcriticalthinking abilities, enabling them to evaluate information rigorously, analyze data effectively, and make informed decisions based on evidence. They will demonstrate proficiency in applying logical reasoning and scientific methods to solve problems and generate new knowledge.

4. **Leadership and Innovation:** Graduates will demonstrate leadership qualities and entrepreneurial mindset, capable of initiating and driving positive change in their organizations and communities. They will exhibit creativity, resilience, and adaptability, harnessing innovation to address complex challenges and seize opportunities for growth and advancement.

5. **Global Citizenship and Cultural Sensitivity**: Graduates will possess a global perspective and cultural sensitivity, recognizing the interconnectedness of diverse communities and the importance of collaboration across borders. They will engage in cross-cultural dialogue, embrace diversity, and contribute to the advancement of knowledge and understanding on a global scale.

These Programme Educational Objectives serve as guiding principles for the Bachelor of Science curriculum, reflectingourcommitmentto nurturingwell-rounded graduates whoare preparedtoexcelintheircareers,contributetosociety,andleadmeaningfullivesinarapidly changing world.

## ProgrammeOutcomes(POs):

The National Education Policy (NEP) 2020 for India emphasizes several key aspects for Bachelor of Science (B.Sc.) programs, aiming to produce graduates who are not only well-versed in their respective disciplines but also equipped with skills necessary for holistic development and employability. While specific program outcomes may vary between institutionsand disciplines within B.Sc. programs, herearesome common outcomes aligned with NEP 2020:

- **PO1. The citizenship and society:** Apply broad understanding of ethical and professionalskillinsciencesubjectsinthecontextofglobal,economic,environmental and societal realities while encompassing relevant contemporary issues.

- **PO2. Environment and sustainability**: Apply broad understanding of impact of science subjects in a global, economic, environmental and societal context and demonstrate the knowledge of, and need for sustainable development.

- **PO3. Ethics:** Apply ability to develop sustainable practical solutions for science subject related problems within positive professional and ethical boundaries.

- **PO4.Individualandteamwork:**Functioneffectivelyasaleaderandaswellasteam member in diverse/ multidisciplinary environments.

- **PO5. Communication:** Communicate effectively on complex science subject related activitieswiththescientificcommunityinparticularandwiththesocietyatlarge,such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- **PO6. Project management and finance**: Demonstrate knowledge and understanding of the first principles of science and apply these to one's own work as a member and leader in a team, to complete project in any environment.

- **PO7.Life-longlearning**:Recognizetheneedforlifelonglearningandhavetheability toengageinindependentandlife-longlearninginthebroadestcontextoftechnological change.

These program outcomes align with the broader goals of NEP 2020 to transform higher education in India and prepare students for the challenges and opportunities of the 21st century. Board of Studies designing B.Sc. curricula are encouraged to incorporate these outcomes into their program objectives and learning outcomes.

## ProgrammeSpecificOutcomes (PSOs):

PSO1. Develop a solid foundation in biochemical principles, including the structure, function, and interactions of biomolecules.

PSO2. Acquire proficiency in laboratory techniques commonly used in biochemical research and analysis.

PSO3. Utilize the scientific method effectively in conducting experiments, testing hypotheses, interpreting data, and drawing logical conclusions.

PSO4. Develop problem-solving and analytical capabilities through engagement with case studies, research papers, and practical hands-on experiences.

PSO5. Cultivate critical thinking and problem-solving skills necessary for addressing complex biochemical questions and challenges.

PSO6. Foster an understanding of the interdisciplinary nature of biochemistry and its applications in fields such as medicine, biotechnology, and environmental science.

PSO7. Prepare students for further education and careers in research, healthcare, pharmaceuticals, biotechnology, and related fields by providing opportunities for hands-on research experiences, internships, and professional development.

## StructureofB.Sc.(Three/FourYearsHonours/HonourswithResearch Degree) Programme with Multiple Entry and Exit Options

### Subject(Major):Biochemistry

### BScFirstYear:1st Semester

| CourseType | Course Code | CourseName | TeachingScheme (Hrs/Week) | | CreditsAssigned | | Total Credits |
|---|---|---|---|---|---|---|---|
| | | | Theory | Practical | Theory | Practical | |
| Major(Core)M1 Mandatory **BIOCHEMISTRY** | DSC-1/ BC-101 | Biochemistry of proteins and carbohydrates | 2 | | 2 | | 2+2 =4 |
| | DSC-2/ BC-102 | Practicalcourse 1 (basedon DSC-1) | | 4 | | 2 | |
| Major(Core)M2 Mandatory | DSC-1/ | | 2 | | 2 | | 2+2 =4 |
| | DSC-2 | Practicalbasedon DSC-1 | | 4 | | 2 | |
| Major(Core)M3 Mandatory | DSC-1 | | 2 | | 2 | | 2+2 =4 |
| | DSC-2 | Practicalbasedon DSC-1 | | 4 | | 2 | |
| Generic / Open Elective(GE/OE) (Chooseanyonefrom pool of courses) **Itshouldbechosen compulsorily from the faculty other than that of Major** | GE/OE-1 | To be chosen from other faculty | 2 | | 2 | | 2 |
| **SEC** (SkillEnhancement Courses) (Chooseanyonefrom pool of courses) | SEC-1/ BC-104 | i) Biochemical Techniques- 1<br>ii) Basic concepts in Bioinformatics | 1 | | 1 | | 2 |
| | SEC-2/ BC-105 | i) Lab course based on SEC A<br>ii) Lab course based on SEC-B | | 2 | | 1 | |
| AEC,VEC,IKS | AEC-1 | English (Commonforall the faculty) | 2 | | 2 | | 2+2=4 |
| | IKS-1 | Chooseanyone from pool of courses | 2 | | 2 | | |
| OJT/ FP/CEP/CC/RP | CC-1 | Healthand Wellness (Commonforall the faculty) | | 4 | | 2 | 2 |
| | | | **13** | **18** | **13** | **09** | **22** |

**GE/OE-1:**BC-103 Biochemistry of Health and Disease(this course will be available for students from other faculty)

## BScFirstYear:2nd Semester

| CourseType | Course Code | CourseName | TeachingScheme (Hrs / Week) | | CreditsAssigned | | Total Credits |
|---|---|---|---|---|---|---|---|
| | | | Theory | Practical | Theory | Practical | |
| Major(Core)M1 Mandatory BIOCHEMISTRY | DSC-3/ BC-201 | Biochemistry of Lipids and Nucleic Acids | 2 | | 2 | | 2+2=4 |
| | DSC-4/ BC-202 | Practicalcourse-2 (basedon DSC-3) | | 4 | | 2 | |
| Major(Core)M2 Mandatory | DSC-3 | | 2 | | 2 | | 2+2=4 |
| | DSC-4 | Practicalbasedon DSC-3 | | 4 | | 2 | |
| Major(Core)M3 Mandatory | DSC-3 | | 2 | | 2 | | 2+2=4 |
| | DSC-4 | Practicalbasedon DSC-3 | | 4 | | 2 | |
| Generic / Open Elective(GE/OE) (Chooseanyonefrom pool of courses) **Itshouldbechosen compulsorily from the faculty other thanthatof Major** | GE/OE-2 | To be chosen from other faculty | 2 | | 2 | | 2 |
| VSC (VocationalSkill Courses) (Chooseanyonefrom pool of courses) | VSC-1/ BC-204 | i) Laboratory Tools and Techniques in Biochemistry<br>ii) Basics of First Aid and Laboratory Safety | 1 | | 1 | | 2 |
| | VSC-2/ BC-205 | i) Lab course based on SEC A<br>ii) Lab course based on SEC-B | | 2 | | 1 | |
| AEC,VEC,IKS | AEC-1 | English (Commonforall the faculty) | 2 | | 2 | | 2+2=4 |
| | VEC-1 | Constitution of India(Common forallthefaculty) | 2 | | 2 | | |
| OJT/ FP/CEP/CC/RP | CC-2 | Yoga Education / SportsandFitness (Common for all thefaculty) | | 4 | | 2 | 2 |
| | | | **13** | **18** | **13** | **09** | **22** |
| **ExitOption:AwardofUGCertificatein3Majorswith44creditsandanadditional4creditsofcoreNSQFcourse /InternshipORcontinuewithMajorandMinor** | | | | | | | |

**GE/OE-2:** BC-203 Nutrition Science (this course will be available for students from other faculty)

## *GeneralGuidelines forCourse Selection*

2) The Major subject is the discipline or course of main focus, bachelor's degree shall be awarded in that discipline / subject.
3) StudentswillhavetochooseanythreesubjectsasaMajor1,Major2,Major3,from**Basket1**unde rtheFacultyofScienceandTechnology(basedontheavailableoptions in the respective college).
4) Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year.
5) In the beginning of second year, students will have to select/declare choice of **one major subject** and **one minor subject** from three major options **M1, M2 and M3 (which were opted in the first year)**
6) Oncethestudentsfinalizetheir**MajorSubject**and**MinorSubject**inthebeginningofthe second year of the programme, they shall pursue their further education in that particular subject as their **Major and Minor** subjects. Therefore, from second year onwards curriculum of the Major and Minor subjects shall be different.
7) Studentsarerequiredtoselect**Minorsubject** from**otherdisciplineof thesame faculty**
8) Studentsarerequiredtoselect**Generic/OpenElective**(vertical3inthecredit framework)compulsorilyfromthefaculty differentthan thatoftheirMajor/Minorsubjects.
9) VocationalSkillCoursesandSkillEnhancementCourses(VSCandSEC)shallberelated to the Major subject
10) Curriculum of Ability Enhancement Courses (AEC), Value Education Courses (VEC), Indian Knowledge System (IKS), and Co-curricular Courses (CC) will be provided by the University separately.

## BScFirstYear:1st Semester

**DSC-1/ BC-101:Biochemistry of Proteins and Carbohydrates**

Total Credits:02 TotalContactHours:30Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

The course aims to provide students with an understanding of biomolecules such as proteins and carbohydrates focusing on their structural underpinnings, unique properties, biological roles and functions, and interrelations.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

- **i)** Acquainted with chemical and molecular foundations of life and appreciate the role of water in biological systems.
- **ii)** Able to comprehend the structure, function, and acid-base properties of amino acids.
- **iii)** Explain the hierarchical structure of structure proteins and their biological significance.
- **iv)** Explain the structures and properties of carbohydrates.

| ModuleNo. | Topics/ actual contentsof the syllabus | Contact Hours |
|---|---|---|
| **I** | A. Foundation of Biochemistry<br>1. Cellular and chemical foundations of life, Water: unique properties, weak interactions in aqueous systems-Hydrogen bond,hydrophilicand hydrophobic interactions, Vander Waals Interactions, electrostatic interactions, ionization of water, Henderson-Hasselbalch Equation, buffering action in biological system, water as a reactant and fitness of the aqueous environment. | **10Hrs** |
| **II** | B. Proteins<br>1. Amino acids: Classification, Properties, reactions, rare amino acids.<br>2. Protein classification: Reactions, functions, properties and Solid phase synthesis.<br>3. Structural levels of protein:<br>4. Primary Structure: Peptide bond, importance of primary structure. Secondary structure: X ray diffraction, alpha-helix, β - structure, β-helix, super secondary structure.<br>5. Tertiary Structure: Forces stabilizing, unfolding/ refolding expt. Prediction of tertiary Structure.<br>6. Quaternary structure: haemoglobin. End group analysis, sequencing and peptide synthesis.<br>7. Ramachandran plot. | **10Hrs** |
| **III** | C. Carbohydrates<br>1. Carbohydrates: Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses.<br>2. Stereoisomerism of monosaccharides, epimers, Mutarotation and anomers of glucose.<br>3. Furanose and pyranose forms of glucose and fructose. | **10Hrs** |

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|---|---|---|
| | Haworth projection formulae for glucose; chair and boat forms of glucose.<br>4. Sugar derivatives, glucosamine, galactosamine, muramic acid, N- acetyl neuraminic acid.<br>5. Disaccharides: concept of reducing and nonreducing sugars, occurrence and Haworth projections of maltose, lactose, and sucrose. | |

***RecommendedBooks:***


1. Nelson DL, Lehninger AL, Cox MM. Lehninger: Principles of biochemistry. 5th edition, WH Freeman & Co. New York; 2008.
2. Berg JM, Tymoczko JL, Stryer L. Biochemistry. 6th edition, WH Freeman & Co. New York; 2006.
3. Conn EE, Stumpf PK, Bruening G, Doi RH, Outlines of Biochemistry. 5th edition, John Wiley & Sons Inc., Singapore; 1987.
4. Voet D &Voet JG, Biochemistry. (3rd Ed.) John Wiley & Sons Inc., Singapore; 2004.
5. Botham K, Mayes P, Murray RK, Granner DK. Harper's illustrated biochemistry. (27th Ed.) McGraw-Hill Companies New York; 2006.

**DSC-2/ BC-102:Laboratory course -1**
**(Based on DSC-1)**

Total Credits:02 TotalContactHours:60Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

**i)** Understand fundamental principles of common biochemical analysis methods.
**ii)** Gain practical skills in performing routine laboratory assays.
**iii)** Interpret and analyze biochemical data accurately.
**iv)** Develop proficiency in troubleshooting laboratory challenges.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

**i)** Demonstrate precise reagent preparation and standardization.
**ii)** Successfully generate buffer solutions meeting specified criteria.
**iii)** Effectively perform amino acid separation via chromatography.
**iv)** Confidently identify carbohydrates using chemical tests.
**v)** Gain practical expertise in biomolecule isolation and characterization.

List of practicals

1. Preparation and standardization of laboratory reagents.
2. Preparation of buffers of known pH and molarity.
3. Separation of amino acid mixture by Paper chromatography
4. Identification of carbohydrate mixture with suitable tests.
5. Specific reactions for Amino acids
6. Isolation of Egg albumin and globulin.
7. Isolation of milk casein by isoelectric pH precipitation.
8. Isolation of Starch and Characterization.
9. Estimation of amino acid by Ninhydrin method
10. Estimation of protein by Biuret method
11. Estimation of protein by Lowry method
12. Estimation of sugar by DNSA method

***TextBooks:***


1. Practical Biochemistry: Principles and techniques: K. Wilson and J. Walker. (2006) 5th Edition
2. Practical Biochemistry by David Plummer (2015) 3rd Edition
3. Introductory Practical Biochemistry by S.K. Sawhney and R. Singh.
4. Practical Biochemistry by J. Jayaraman
5. Biochemical methods by S. Sadasivam and A. Manickam (2010) New Age International. New Delhi

**SEC-1/ BC-104-A:Biochemical Techniques- 1**

Total Credits:01 TotalContactHours:15Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

i) Acquire knowledge about the principles and applications of spectrophotometric and chromatography techniques used in a biochemistry lab.
ii) Learn about the principles and applications of electrophoresis and centrifugation techniques.
iii) Obtain hands-on experience and laboratory skills expected of any biochemist working in a research lab.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

i) Explain the principles and applications of spectrophotometric and chromatography techniques used in a biochemistry lab.
ii) Explain the principles and applications of electrophoresis and centrifugation techniques.
iii) Develop proficiency in essential laboratory skills, preparing students for roles as biochemists in research environments.

| ModuleNo. | Topics/ actual contentsof the syllabus | Contact Hours |
|---|---|---|
| I | **Spectroscopic Techniques**<br>Electromagnetic radiation, interaction of radiation with biomolecules, principle of UV-visible absorption spectrophotometry, Lambert's Law, Beer's Law, Working of a spectrophotometer. Applications of UV-visible absorption spectrophotometry in Biochemistry. Fluorescence spectrophotometry and its applications in biochemistry. | **5 Hrs** |
| II | **Electrophoresis**<br>Principle of electrophoresis, Polyacrylamide gel electrophoresis (native and denaturing) for proteins and nucleic acids. Agarose gel electrophoresis, Isoelectric focusing of proteins, two dimensional. Detection and identification of proteins and nucleic acids and determination of molecular weight.<br>**Centrifugation**<br>Principle of centrifugation, basic rules of sedimentation, sedimentation coefficient. Various types of centrifuges, types of rotors. Application of centrifugation, differential centrifugation, density gradient centrifugation (zonal and isopycnic). | **5 Hrs** |
| III | **Chromatography**<br>Introduction to chromatography. Principle and applications of Paper Chromatography, Thin Layer Chromatography, exchange chromatography, Gel filtration and Affinity Chromatography. | **5Hrs** |

***RecommendedBooks:***


1. Boyer, R. F. (2012) Biochemistry Laboratory: Modern Theory and Techniques, (6th ed.), Boston, Mass: Prentice Hall; ISBN-13: 978-0136043027.
2. Plummer, D. T. (1998) An Introduction to Practical Biochemistry (3rd ed.), Tata McGraw Hill Education Pvt. Ltd. (New Delhi); ISBN: 13: 978-0-07-099487-4 / ISBN:10: 0-07-099487-0.
3. Wilson, K. & Walker J (2010) Principles and Techniques of Biochemistry and Molecular Biology, (7 th ed.), Cambridge University Press; ISBN 978-0-521-51635-8.

**SEC-1/ BC-104-B:Basic concepts in Bioinformatics**

Total Credits:01 TotalContactHours:15Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

i) To learn and acquire bioinformatics skills.
ii) To know about some popular online tools and databases in bioinformatics.
iii) At the end of the course students will become aware of the basic tools and techniques in bioinformatics and use them for handling biology data.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

i) Understanding the basics of bioinformatics and its applications
ii) Difference between databases and various biological databases
iii) Performing data storage methods and various formats.
iv) Understanding sequence alignment and types of sequence alignment.

| Module No. | Topics/ actual contentsof the syllabus | Contact Hours |
|---|---|---|
| **I** | Introduction, overview and needs of bioinformatics technology. Biological databases<br>Mode of data storage - File formats - FASTA, Genbank and Uniprot, Data submission & retrieval from NCBI, EMBL, DDBJ, Uniprot, PDB. | **5 Hrs** |
| **II** | Introduction to sequence alignment and its applications.<br>Pair wise sequence alignment: Concept of global and local alignment, Dot Plot, algorithm for pairwise sequence alignment (Needleman Wunsch, Smith-watterman methods).<br>Introduction to BLAST: types of BLAST, algorithm of BLAST and interpretation of its result. Introduction to substitution matrices: PAM and BLOSUM matrices, concept of log odd ratio. | **5 Hrs** |
| **III** | Multiple sequence alignment: Methods of multiple sequence alignment, Tools of MSA– ClustalW, TCoffee; Position specific scoring matrices, introduction to consensus sequences, motifs and profiles.<br>Significance of alignments, Basic concepts of Genome, transcriptome, proteome. | **5Hrs** |

***RecommendedBooks:***


1. Bioinformatics – 2008. Principles and Applications, 1st ed. Ghosh, Z. and Mallick, B., Oxford University Press (India),
2. M. Michael Gromiha, 2010. Protein Bioinformatics: From Sequence to Function, Academic Press.
3. Bioinformatics: Sequence and Genome Analysis (2001), 1st ed., Mount, D.W. Cold Spring Harbor Laborator Press (New York)
2. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins (2005), 3rd ed., Baxevanis, A.D. and Ouellette, B.F., John Wiley & Sons, Inc. (New Jersey).

**SEC-2/ BC-105-A:Laboratory course**
**(Based on SEC-1A)**

Total Credits:01 TotalContactHours:30Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

**i)** Acquire knowledge about the principles and applications of spectrophotometric and chromatography techniques used in a biochemistry lab.
**ii)** Learn about the principles and applications of electrophoresis and centrifugation techniques.
**iii)** Obtain hands-on experience and laboratory skills expected of any biochemist working in a research lab.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

i) Demonstrate spectroscopic techniques and their applications in determining absorption maxima and molar extinction coefficients.
ii) Perform experimental verification of Beer's Law and apply it to quantitative analysis effectively.
iii) Achieve competency in separating biomolecules using chromatography and electrophoresis methods.
iv) Interpret chromatograms and electropherograms for qualitative and quantitative analysis of biomolecules.
v) Perform gel electrophoresis and SDS-PAGE for protein separation and analysis.

List of practicals

1. Determination of absorption maxima (λmax) of small molecules and macromolecules.
2. Verification of Beer's Law.
3. Determination of molar extinction coefficient.
4. Separation of amino acid acids/sugars by thin layer chromatography (TLC)
5. Separation of proteins by gel filtration chromatography
6. Separation of proteins by ion-exchange chromatography
7. Separation of nucleic acids using agarose gel electrophoresis
8. Separation of protein by SDS-PAGE.

***RecommendedBooks:***


1. Practical Biochemistry: Principles and techniques: K. Wilson and J. Walker. (2006) 5th Edition
2. Practical Biochemistry by David Plummer (2015) 3rd Edition
3. Introductory Practical Biochemistry by S.K. Sawhney and R. Singh.
4. Practical Biochemistry by J. Jayaraman
5. Biochemical methods by S. Sadasivam and A. Manickam (2010) New Age International. New Delhi

**SEC-2/ BC-105-B:Laboratory course**
**(Based on SEC-1B)**

Total Credits:01 TotalContactHours:30Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

i) Familiarization with Genome and Protein Information Resources:
ii) Gain insight into the organization and content of database entries for genomic and protein sequences.
iii) Develop skills in using bioinformatics search engines like Entrez and SRS to retrieve specific biological data efficiently.
iv) Acquire proficiency in Biological Data Analysis Techniques
v) Gain practical experience in visualizing molecular structures using software tools like Rasmol and Pymol.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

i) Navigate and retrieve genomic and protein data from major databases effectively.
ii) Demonstrate proficiency in interpreting database entries and extracting relevant biological information.
iii) Develop advanced search skills and strategies for retrieving specific biological data using bioinformatics search engines.
iv) Perform basic sequence analysis tasks, including sequence alignment, phylogenetic analysis, and data visualization.

List of practicals

1. Introduction to Genome Information resources- EMBL, DDBJ, GENBANK
2. Introduction to Protein Information resources- PIR, SWISS-PROT, PRINTS, PFAM
3. Structure of a database entry.
4. Search engines: Entrez, SRS.
5. Analysis of biological data using: BLAST, FASTA, Clustal W, Treeview, Phylip,
6. Structure visualization using Rasmol, pymol
7. Primer analysis using OLIGO, Primer3
8. Automated gene prediction tools.

***RecommendedBooks:***


1. Lesk, Arthur. Introduction to bioinformatics. Oxford university press, 2019.
2. 2. Claverie, J.M. and Notredame C. 2007 Bioinformatics for Dummies. Wiley Editor.
3. 3. Baxevanis, Andreas D., Gary D. Bader, and David S. Wishart, eds. Bioinformatics. John Wiley & Sons, 2020.
4. 4. Bolyen, Evan, Jai Ram Rideout, John Chase, T. Anders Pitman, Arron Shiffer, Willow Mercurio, Matthew R. Dillon, and J. Gregory Caporaso. "An Introduction to Applied Bioinformatics: a free, open, and interactive text." The Journal of open source education 1, no. 5 (2018).

## This course will be available for the students from other faculty

**GE/OE-1/ BC-103:Biochemistry in Health and Diseases**

Total Credits:02 TotalContactHours:30Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

i) The course aims to provide students from diverse streams with knowledge about health and terminology related to health and disease,
ii) Differentiate between communicable and non-communicable diseases,
iii) Explore concepts of health promotion, treatments, and interventions for various diseases and disorders

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

i) Proficiently utilize health-related terminologies and distinguish between communicable and non-communicable diseases.
ii) Apply critical thinking to implement health promotion strategies, analyze diverse treatments and interventions for diseases.
iii) Demonstrate an interdisciplinary understanding of health across various streams.

| Module No. | Topics/ actual contentsof the syllabus | Contact Hours |
|---|---|---|
| **I** | Introduction:<br>1. WHO definition of health, Health and hygiene, General health care, Factors affecting health, Indices and evaluation of health, Disease patterns in developed and developing world.<br>2. Classification of diseases - Endemic, Epidemic, Pandemic; Professional health hazards. Disease conditions: Acute disease, Chronic disease, Incurable disease, Terminal disease, Illness, disorders, Syndrome, Pre-disease.<br>3. Treatment: Psychotherapy, Medications, Surgery, Medical devices, and Self-care. Dimensions of Health: Physical, Mental, Spiritual, Emotional, Environmental, Philosophical. | **10Hrs** |
| **II** | Communicable and non-communicable diseases:<br>1. Communicable diseases: Tuberculosis, Cholera, Typhoid, Conjunctivitis. Sexually transmitted diseases (STD).<br>2. Non-communicable diseases: Malnutrition- Under nutrition, Overnutrition, Nutritional deficiencies; Anaemia, Stroke, Rheumatic heart disease, Coronary heart disease, Cancer, blindness, accidents, mental illness, Iodine deficiency, Fluorosis, Epilepsy, Asthma.<br>3. Genetic disorders: Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Thalassemia, Sickle cell anaemia. Lifestyle disorders: Obesity, Liver cirrhosis, Diabetes mellitus, Hypertension (Causative agents, symptoms, diagnosis, treatment, prognosis, prevention) | **10Hrs** |

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| **III** | Health Promotions:<br>3. Preventing drug abuse, Oral health promotion by tobacco control.<br>4. Mental hygiene and mental health: Concepts of mental hygiene and mental health, Characteristics of a mentally healthy person, Warning signs of poor mental health,<br>5. Promotive mental health, strategies and services, Ego defense mechanisms and implications, Personal and social adjustments, Guidance and Counselling.<br>6. Infection control: Nature of infection, Chain of infection transmission, Defenses against infection transmission | **10Hrs** |

***Books recommended:***


1. Modern Nutrition in Health and Disease 2006 10th Edition by Maurice E. Shils, Moshe Shike, A Catharine Ross.
2. Clinical Biochemistry and Metabolic Medicine, 2012 Eighth Edition by Martin Andrew Crook, CRC Press,
3. Nutrition & Health in Developing Countries, 2000, Editors: R. Semba and M.W. Bloem, Humana Press

# BScFirstYear:2nd Semester

**DSC-3/ BC-201:Biochemistry of Lipids and Nucleic Acids**

Total Credits:02 TotalContactHours:30Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

i) Recognize and explain the structural and functional properties of and nucleic acids.
ii) Emphasize the role of these biomolecules by providing basic information on specific metabolic diseases and disorders of these biomolecules.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

i) Identify the structural and functional differences between different types of lipids, micelles, vesicles and assess the effect of lipids on human health
ii) Explain the structures and properties of nitrogenous bases, nucleotides and nucleosides.
iii) Describe the structural arrangement of Purine and Pyrimidine bases towards the stability of DNA and RNA.

| ModuleNo. | Topics/ actual contentsof the syllabus | Contact Hours |
|---|---|---|
| I | LIPIDS:<br>1. Building blocks of lipids - fatty acids, glycerol, ceramide; Storage lipids - triacyl glycerol and waxes.<br>2. Structural lipids in membranes – glycerophospholipids; Galactolipids and sulpholipids, ether lipids, sphingolipids and sterols, structure, distribution, and role of membrane lipids.<br>4. Plant steroids; Lipids as signals, cofactors, and pigments. Qualitative tests for lipids.<br>5. Formation of micelles, monolayers, bilayer, liposomes. | **10Hrs** |
| II | VITAMINS and CO-ENZYMES:<br>1. Classification,<br>2. water-soluble and fat-soluble vitamins.<br>3. Structure, dietary requirements, deficiency conditions,<br>4. Coenzyme forms and their mechanism. | **10Hrs** |
| III | NUCLEIC ACIDS:<br>1. Nucleotides - structure and properties of bases, pentoses, nucleosides.<br>2. Nucleic acid structure – Watson-Crick model of DNA, forms of DNA.<br>3. Structure of major species of RNA - mRNA, tRNA and rRNA.<br>4. Nucleic acid chemistry - UV absorption, effect of acid and alkali on DNA.<br>5. Other functions of nucleotides - source of energy, component of coenzymes and second messengers. | **10Hrs** |

***Recommended Books:***


1. Lehninger's Principles of Biochemistry by D. L. Nelson and M. M. Cox.
2. Biochemistry by Lubert Stryer.
3. Biochemistry by Zubay.
4. Biochemistry by Garrett and Grisham.
5. Biochemistry by Voet and Voet Nelson DL, Lehninger AL, Cox MM. Lehninger: Principles of biochemistry. 5th edition, WH Freeman & Co. New York; 2008.
6. Berg JM, Tymoczko JL, Stryer L. Biochemistry. 6th edition, WH Freeman & Co. New York; 2006.
7. Conn EE, Stumpf PK, Bruening G, Doi RH, Outlines of Biochemistry. 5th edition, John Wiley & Sons Inc., Singapore; 1987.
8. Voet D &Voet JG, Biochemistry. (3rd Ed.) John Wiley & Sons Inc., Singapore; 2004.
9. Botham K, Mayes P, Murray RK, Granner DK. Harper's illustrated biochemistry. (27th Ed.) McGraw-Hill Companies New York; 2006.

**DSC-4/ BC-202:Laboratory course -2**
**(Based on DSC-3)**

Total Credits:02 TotalContactHours:60Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

i) Understand fundamental principles of common biochemical analysis methods.
ii) Gain practical skills in performing routine laboratory assays.
iii) Interpret and analyze biochemical data accurately.
iv) Develop proficiency in troubleshooting laboratory challenges.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

i) Efficiently isolate cholesterol and lecithin from egg samples.
ii) Accurately estimate the vitamin C content in lemon fruits.
iii) Precisely determine the iodine number of fats.
iv) Calculate the saponification value of fats reliably.
v) Successfully isolate genomic DNA from plant and animal cells.

List of Practicals

1. Isolation of Cholesterol and lecithin from egg.
2. Estimation of Vitamin C from lemon fruits.
3. Determination of iodine number of fat
4. Determination of saponification value of fat
5. Determination of acid value of fat
6. Isolation of genomic DNA from plant cells
7. Isolation of genomic DNA from animal cells
8. Estimation of RNA by Orcinol method
9. Estimation of DNA by diphenylamine method

***Recommended Books:***


1. Practical Biochemistry: Principles and techniques: K. Wilson and J. Walker. (2006) 5th Edition
2. Practical Biochemistry by David Plummer (2015) 3rd Edition
3. Introductory Practical Biochemistry by S.K. Sawhney and R. Singh.
4. Practical Biochemistry by J. Jayaraman
5. Biochemical methods by S. Sadasivam and A. Manickam (2010) New Age International. New Delhi

**VSC-1/BC-204-A: Laboratory Tools and Techniques in Biochemistry**

Total Credits:01 TotalContactHours:15Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

To equip students with practical proficiency in handling laboratory equipment, reagent preparations and laboratory safety.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

- **i)** Demonstrate adept laboratory skills in solution preparation, storage etc. while adhering to safety practices.
- **ii)** Achieve an understanding of solution concentration concepts and exhibit precision in the preparation and storage of standard solutions.
- **iii)** Attain expertise in operating and applying various laboratory instruments, including weighing balance, pH meter, autoclave, incubators, bio-safety hoods, pipettes, and the MilliQ water system.
- **iv)** Apply principles of asepsis and sterilization techniques to maintain a sterile laboratory environment, preventing contamination during experimental procedures.
- **v)** Acquire proficiency in the practical application of biophysical techniques, including microscopy, centrifugation, and UV/visible absorption spectroscopy, with a focus on analysing proteins and nucleic acids.

| Module No. | Topics/ actual contentsof the syllabus | Contact Hours |
|---|---|---|
| **I** | Basic Lab Practices and Preparation of Solutions Safety practices in the laboratory, preparation and storage of solutions, concepts of solution concentration and storing solutions: Standard solutions, molar, normal, molal, formal and percent strengths, quantitative transfer of liquids. Special chemical requirement of biomolecules, factors affecting analyte structure and stability, pH, temperature and solvent polarity, buffering systems used in biochemistry, concept of colligative properties (no derivations), osmolarity, diffusion of solutes in solution. | **5Hrs** |
| **II** | Basic Instruments and techniques: Working principles, basic operation and application of weighing balance, pH meter, autoclave, laminar air flow, Water Baths, $CO_2$ Incubators, Shaking Incubators, Hot Air Ovens, Bio-Safety Hoods. Pipettes and MilliQ water system. Principle of asepsis and sterilization technique | **5 Hrs** |
| **III** | Microscopy – Working principles, basic operation and application of Light and phase contrast microscope. Centrifugation techniques: Sedimentation (Sedimentation coefficient, Svedberg unit), Centrifugation: Working | **5Hrs** |

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| | principles, basic operation and application of micro-centrifuge, ultracentrifuge and density gradient centrifugation, applications (isolation of cell components). Different Biophysical Techniques Theories of light (wave-particle duality), the electromagnetic spectrum, UV/visible absorption spectroscopy, physical basis, Beer Lambert's law, deviations of Beer Lambert's law, transitions, applications of UV-visible spectroscopy, UV-visible spectroscopy of proteins and nucleic acids | |

***Books recommended:***


1. Physical Chemistry - P. C. Rakshit
2. Lehninger Principles of Biochemistry - Nelson & Cox Text
3. Book of Physical Chemistry - K. L. Kapoor
4. Physical Chemistry-Hrishikesh Chatterjee
5. Techniques and Methods in Biology - K. L. Ghatak
6. Physical Biochemistry: Principles and Applications - D. Sheehan,
7. Physical Biochemistry: Applications to Biochemistry and Molecular Biology – D. Freifelder
8. An Introduction to Practical Biochemistry – D. T. Plummer
9. Molecular Spectroscopy - C. N. Banwell & McCash Organic Spectroscopy - William Kemp

**VSC-1/BC-204-B: Basics of First Aid and Laboratory Safety**

Total Credits:01 TotalContactHours:15Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

i) This course aims to equip participants with fundamental knowledge and skills in both first aid and laboratory safety.
ii) Through comprehensive training, students will learn to identify workplace hazards, respond effectively to medical emergencies, and promote a safe and secure environment in laboratory settings.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

**i)** Gain a thorough understanding of fundamental concepts and practices in both first aid and laboratory safety.
**ii)** Develop the ability to identify potential workplace hazards and implement appropriate safety measures to mitigate risks.
**iii)** Acquire the skills necessary to respond promptly and effectively to medical emergencies, demonstrating competence in providing initial care and support.
**iv)** Cultivate a proactive approach to safety management, fostering a culture of awareness and responsibility to ensure a safe and secure laboratory environment for all.

| Module No. | Topics/ actual contentsof the syllabus | Contact Hours |
|---|---|---|
| **I** | Basics of First Aid:<br>1. Introduction to First Aid- Origin, aim and scope of first aid, Overview of the human body, first aid equipment- Contents of the first aid box, Role and responsibilities of a first aider- Assessing the situation and acting safely, effectively and promptly in an emergency.<br>2. Emergency care- Assessing the Victim: primary survey, secondary survey, head-to-toe examination, monitoring vital sign, use of eyewash and showers for chemical spillage, Cardiopulmonary Resuscitation (CPR), Airway Obstructions, Controlling Bleeding, managing unconscious casualty: checking and monitoring breathing and circulation, life-saving priorities for unconscious adults, unconscious child, unconscious infant. | **5Hrs** |
| **II** | Protocols for Common injuries and their immediate care for different emergencies- Shock, Wounds and soft tissue Injuries, Burns, Head and spinal Injuries, Chest, Abdominal and Pelvic Injuries, Bone, Joint and Muscle Injuries, Extremity Injuries and Splinting, Poisoning, Bites and Stings Sudden illness, Drowning, hyperventilation, asthma, Cold and heat emergencies, Electrical Incidences, choking in adults and infants. | **5 Hrs** |

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| **III** | Laboratory safety:<br>1. Responsibilities in laboratory, Purpose and responsibilities, Basic laboratory safety practices<br>2. Chemical Managements<br>• Introduction to chemical inventory and material safety data sheet<br>• Chemical storage and chemical labelling<br>• Transportation of chemicals in the laboratory<br>• Special chemical hazards<br>3. Introduction to Personal Protective Equipment<br>Eye protection, face protection, hand protection, head protection, foot protection, protective clothing, respiratory protection and hearing protection.<br>Safe handling of glassware. | **5Hrs** |

***Books recommended:***


1. C. C. Fevzi and I. Adnan, Laboratory safety handbook, 1st Edition, 2016, Sabanci University.
2. Laboratory safety manual, Environmental Health and Safety Department, University of Washington, December 2021 Edition. (www.ehs.washington.edu)
3. D. Philpott, Fundamentals of Fire Protection for the Safety Professional, 3rd Edition, 2022, Bernan Press.
4. Indian Standard- 2190:2010, Selection, Installation and Maintenance of First-Aid Fire Extinguishers Code of Practice (Fourth Revision) (http://tricone.co.in/Downloads/selection,installation_and_maintenance_of_firstAid_Fire_Extinguishers1_IS%201290.pdf)
6. I. Clement, Textbook on First Aid & Emergency Nursing, 1st Edition, 2012, JP brothers. 13. P. Jevon, Emergency care and First Aid for Nurses, A practical guide, 1st Edition, 2007, Churchill Living Stone.

**VSC-2:Laboratory course based on VSC-1A**

Total Credits:01 TotalContactHours:30Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**
To equip students with practical proficiency in handling laboratory equipment, reagent preparations and laboratory safety.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

- **i)** Achieve an understanding of solution concentration concepts and exhibit precision in the preparation and storage of standard solutions.
- **ii)** Attain expertise in operating and applying various laboratory instruments, including weighing balance, pH meter, autoclave, incubators, bio-safety hoods, pipettes, and the MilliQ water system.
- **iii)** Apply principles of asepsis and sterilization techniques to maintain a sterile laboratory environment, preventing contamination during experimental procedures.
- **iv)** Acquire proficiency in the practical application of biophysical techniques, including microscopy, centrifugation, and UV/visible absorption spectroscopy, with a focus on analysing proteins and nucleic acids.

List of practicals

1. Safety measures in laboratories, use and calibration of pipettes.
2. Preparation of normal, molar and percent solutions
3. Introduction to laboratory equipments: Construction, operation and utility of the laboratory equipment- weighing balance, pH meter, autoclave, incubators, bio-safety hoods, pipettes, and the MilliQ water system etc.
4. Standardization of NaOH and acetic acid solutions
5. Concept of pH and preparation of buffers, pH metric titration of a weak acid with a strong base.
6. Verification of Beer's and Lamberts law.
7. Determination of extinction coefficient of different BSA solutions by spectrophotometer.

***RecommendedBooks:***


1. Techniques and Methods in Biology - K. L. Ghatak
2. Physical Biochemistry: Principles and Applications - D. Sheehan,
3. Physical Biochemistry: Applications to Biochemistry and Molecular Biology – D. Freifelder
4. An Introduction to Practical Biochemistry – D. T. Plummer
5. Molecular Spectroscopy - C. N. Banwell & McCash Organic Spectroscopy - William Kemp

**VSC-2:Laboratory course based on VSC-1B**

Total Credits:01 TotalContactHours:30Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

i) Understand the principles of first aid, including initial assessment, CPR, and AED usage.
ii) Demonstrate proficiency in laboratory safety protocols, including chemical spill response, fire extinguisher operation, and personal protective equipment (PPE) usage.
iii) Develop skills in identifying and responding to common laboratory hazards, such as chemical exposures, burns, and cuts.
iv) Gain practical experience in applying basic first aid techniques, including bandaging, wound care, and splinting.

**CourseOutcomes(COs):**

Aftercompletion ofthe course, students willbe able to–

**i)** Effectively perform CPR and use an AED to respond to cardiac emergencies.
**ii)** Demonstrate competence in handling chemical spills and implementing appropriate safety measures in laboratory settings.
**iii)** Develop the skills necessary to assess and respond to various types of injuries and emergencies encountered in laboratory environments.
**iv)** Get awareness of safety practices and a commitment to promoting a culture of safety in laboratory and workplace settings.

List of practicals

1. Chemical Spill Response Simulation: Hands-on Training for Laboratory Safety and Emergency Preparedness
2. Fire Extinguisher Training
3. Bandaging and Wound Care Practice
4. CPR and AED Training
5. Chemical Safety Testing
6. Emergency Eye Wash and Shower Drill
7. Personal Protective Equipment (PPE) Fitting and Inspection
8. Biohazard Spill Response Training

***RecommendedBooks:***


1. C. C. Fevzi and I. Adnan, Laboratory safety handbook, 1st Edition, 2016, Sabanci University.
2. Laboratory safety manual, Environmental Health and Safety Department, University of Washington, December 2021 Edition. (www.ehs.washington.edu)
3. D. Philpott, Fundamentals of Fire Protection for the Safety Professional, 3rd Edition, 2022, Bernan Press.
4. Indian Standard- 2190:2010, Selection, Installation and Maintenance of First-Aid Fire Extinguishers Code of Practice (Fourth Revision) (http://tricone.co.in/Downloads/selection,installation_and_maintenance_of_firstAid_Fire_Extinguishers1_IS%201290.pdf)
5. I. Clement, Textbook on First Aid & Emergency Nursing, 1st Edition, 2012, JP brothers. 13. P. Jevon, Emergency care and First Aid for Nurses, A practical guide, 1st Edition, 2007, Churchill Living Stone.

## This course will be available for the students from other faculty

**GE/OE-2/ BC-203:Nutrition Science**

Total Credits:02 TotalContactHours:30Hrs
Maximum Marks: 50

**LearningObjectivesof theCourse:**

To provide students with a comprehensive understanding of nutrition science, covering principles of human nutrition, dietary analysis, and the impact of nutrition on health and well-being.

**CourseOutcomes(COs):**
After completion of the course, students will be able to –

**i)** Explain nutrients in foods and the specific functions in maintaining health.
**ii)** Apply knowledge of the role of nutrition and healthy eating for disease prevention and wellness
**iii)** The student learns the impact of various functional foods on our health.

| Module No. | Topics/ actual contentsof the syllabus | Contact Hours |
|---|---|---|
| **I** | Basic concepts in nutrition:<br>1. Introduction, Basic principles of a balanced diet to provide energy and nutrients.<br>2. Composition of foods and proximate analysis of foods.<br>3. Calorific value of foods, and Basal metabolism.<br>4. Basal Metabolic Rate (BMR), Factors affecting BMR, Energy requirements for different physical activities, Specific dynamic action of food, Nutritive value of proteins.<br>5. Energy requirements and recommended dietary allowance (RDA) for infants, children and pregnant women. Protein calorie malnutrition. | **10Hrs** |
| **II** | Macronutrients and Micronutrients:<br>1. Carbohydrates- Digestible and non-digestible, Dietary fibres, Essential fatty acids, lipoproteins and Cholesterol.<br>2. Essential amino acids, Fortification of foods, Protein requirement for different categories.<br>3. Vitamins-Sources, requirements, functions and deficiency symptoms of Vitamin-C, Thiamine, Riboflavin, Pyridoxine, Folic acid, Vitamin B12. Absorption of fat-soluble vitamins- A, D, E and K.<br>4. Micronutrients: Source, Daily requirement, functions and deficiency disease symptoms of Macro minerals (Ca, P, and Cl) and micro minerals/trace elements (I, Fe, Zn and Se). | **10Hrs** |
| III | Dietetics and Diet Therapy:<br>1. Introduction. Food pyramid. Diet planning and introduction to diet therapy. | **10 Hrs** |

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| | 2. Nutritional requirements for different age groups, anemic child, expectant women, and lactating women.<br>3. Diet planning for prevention and cure of nutritional deficiency disorders.<br>4. Diet therapy: Functional foods, Anthropometric measurements, dietary considerations during fever, malaria, and tuberculosis.<br>5. Prevention and correction of obesity, underweight, and metabolic diseases by diet therapy.<br>6. Dietary interventions to correct and or manage the gastrointestinal diseases (indigestion, peptic ulcer, constipation, diarrhea, steatorrhea, irritable bowel syndrome.<br>7. Functional foods-based diet therapy for diabetes, cardiovascular disease and cancer. | |

***Books recommended:***


1. Clinical Dietetics and Nutrition, 2002, Antia FP and Abraham P. Oxford University Press; 4 th Edition. ISBN-10: 9780195664157.
2. Oxford Handbook of Nutrition and Dietetics, 2011, Webster-Gandy J, Madden A and Holds worth M. Oxford University Press, Print ISBN-13: 9780199585823.
3. Krause's Food, Nutrition and Diet therapy, 2003, Mahan KL and Escott-Stump S. Elsevier, ISBN: 9780721697840.
4. Human Nutrition and Dietitics. 1986, Passmore R. and Davidson S. Churchill Livingstone Publications, ISBN-10: 0443024863.
5. Rosemary Stanton's Complete Book of Food & Nutrition, 2007, Simon & Schuster Publishers, Australia, ISBN 10: 0731812999
6. Food Science and Nutrition, 2018, Roday S. Oxford University Press Publishers, ISBN: 9780199489084/0199489084.
7. Food Science, 2007, Srilakshmi S. New Age International (P) Limited Publishers, ISBN: 9788122420227/ 8122420222.


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