



**MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL-624 101**

DEPARTMENT OF BIOTECHNOLOGY

B.Sc. BIOCHEMISTRY

Curriculum Framework, Syllabus, and Regulations

(Based on TANSCHÉ Syllabus under choice Based Credit System – CBCS)



(For the candidates to be admitted from the Academic Year 2023-2024)

B.Sc. BIOCHEMISTRY
(TANSICHE based, 2023 – 2024)

Preamble

Biochemistry is the cross over scientific discipline that integrates the living world and chemistry. It involves the study of the structure of biomolecules and explores the biological processes at molecular level in the living organisms. It is the laboratory science that has several domains like cell biology, molecular biology, clinical biology, enzymology, immunology, physiology, pharmacology etc.,

It has enlightened many aspects of health and diseases and paved the way for many interdisciplinary technological innovations like metabolomics, genomics and proteomics. There is a continuous demand for biochemists in public and private health care sectors, agriculture, medical and forensic departments. Almost all food, pharmaceuticals, health and beauty care etc required quality control and safety checks for which experts in the field of Biochemistry are always in need. The syllabi for the three year B.Sc., degree programme in Biochemistry was framed in such a way that at the end of the course they could apply the knowledge and expertise in industries, diagnostic laboratories and various research fields.

The programme end favours to provide students a broad based training in biochemistry with a solid background of basic concepts as well as exposing them to the exciting advancements in the field. In addition to theoretical knowledge, significant emphasis has been given to provide hands on experience to the students in the forefront areas of experimental biochemistry. A multidisciplinary approach has been employed to provide the best leverage to students to enable them to move into frontier areas of biological research in the future.

The course defines clearly the objectives and the learning outcomes, enabling students to choose the elective subjects for broadening their skills. The course also offers skills to pursue research in the field of Biological Chemistry and thus would produce best minds to meet the demands of society.

Biochemistry, today is considered as an application oriented integrated basic science. It's an interdisciplinary science that has emerged by the confluence of principles of Chemistry, Physics and Mathematics to Biology. Advances in Biochemistry have immense positive implications on the understanding of biochemical interactions, cellular communications, hormonal mechanisms

and the cross talks between them. The research in Biochemistry has been translational and there is a shift from hypothesis driven research to data dependent research that promises translational, product oriented research. Much of the advancement in Biochemistry is in the advancement of Biotechnology, as a basic science discipline Biochemistry lead to Biotechnological advancement. Considering its pivotal role in biological sciences, it is imperative to strengthen the fundamental concepts of Biochemistry.

| TANSCHÉ REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION | |
|--|---|
| Programme: | B.Sc Biochemistry |
| Programme Code: | U23BC |
| Duration: | 3 years [UG] |
| Programme Outcomes: * | PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one’s views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. PO4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one’s learning to real life situations. PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define |

problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO9: Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.

PO10 Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn“, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

| | |
|-------------------------------------|--|
| Programme Specific Outcomes: | <p>PSO1 – Placement: To prepare the students who will demonstrate respectful engagement with others’ ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO 2 - Entrepreneur: To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p>PSO3 – Research and Development: Identify and utilize the tools and techniques in the research and development</p> <p>PSO4 – Contribution to Business World: To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO 5 – Contribution to the Society: To contribute to the development of the society by collaborating with stakeholders for mutual benefit</p> |
|-------------------------------------|--|

PROGRAM OUTCOMES

| | |
|------------|--|
| PO1 | Acquire knowledge in Biochemistry and apply the knowledge in their day to day life for betterment of self and society |
| PO2 | Develop critical ,analytical thinking and problem solving skills |
| PO3 | Develop research related skills in defining the problem, formulate and test the hypothesis, analyse, interpret and draw conclusion from data |
| PO4 | Address and develop solutions for societal and environmental needs of local, regional and national development |
| PO5 | Work independently and engage in lifelong learning and enduring proficient progress |
| PO6 | Provoke employability and entrepreneurship among students along with ethics and communication skills |

PROGRAMME SPECIFIC OUTCOMES

| | |
|-------------|---|
| PSO1 | Comprehend the knowledge in the biochemical, analytical, biostatistical and computational areas |
|-------------|---|

| | |
|-------------|--|
| PSO2 | Ability to understand the technical aspects of existing technologies that help in addressing the biological and medical challenges faced by human kind |
| PSO3 | Acquiring analytical and hands on skills to perform research in multidisciplinary environments |
| PSO4 | Use library search tools and online databases and sources to locate and retrieve scientific information about a topic and techniques related to biochemistry |

Eligibility for admission

Candidate for admission to the first year of B.Sc. Degree Course in Bio-Chemistry shall be required to have passed the Higher Secondary Examination with Chemistry and Biology or Chemistry, Botany and Zoology or Biochemistry and Chemistry.

| Methods of Evaluation | | |
|----------------------------------|---|-----------|
| Internal Evaluation | Continuous Internal Assessment Test | 25 Marks |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| External Evaluation | End Semester Examination | 75 Marks |
| | Total | 100 Marks |
| Methods of Assessment | | |
| Recall(K1) | Simple definitions, MCQ, Recall steps, Concept definitions | |
| Understand/Comprehend(K2) | MCQ, True/False, Short essays, Concept explanations, Short summary or Overview | |
| Application (K3) | Suggest idea / concept with examples, Suggest formulae, Solve problems, Observe, Explain | |
| Analyze(K4) | Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge | |
| Evaluate(K5) | Longer essay/Evaluation essay, Critique or justify with pros and cons | |
| Create(K6) | Check knowledge in specific or off beat situations, Discussion, Debating or Presentations | |

Project Report

A student should select a topic for the Project Work at the end of the fifth semester itself and submit the Project Report at the end of the sixth semester. The Project Report shall not exceed 75 typed pages in Times New Roman font with 1.5 linespace.

- **Question Paper Pattern for External examination for all course papers.**

| Max. Marks: 75 | | | Time: 3 Hrs. |
|-----------------------|-------------|---|---------------------|
| S.No. | Part | Type | Marks |
| 1 | A | 10*1 Marks=10 Multiple Choice Questions (MCQs): 2 questions from each Unit | 10 |
| 2 | B | 5*4=20 Two questions from each Unit with Internal Choice (either / or) | 20 |
| 3 | C | 3*15=45 Open Choice: Any three questions out of 5 : one question from each unit | 45 |
| Total Marks | | | 75 |

* **Minimum credits required to pass: 140**

Project Evaluation

There is a Viva Voce Examination for Project Work. The Guide and an External Examiner shall evaluate and conduct the Viva Voce Examination. The Project Work carries 100 marks (Internal: 25Marks; External (Viva):75 Marks).

Conversion of Marks to Grade Points and Letter Grade (Performance in a Course/Paper)

| Range of Marks | Grade Points | Grade | Description |
|----------------|--------------|-------|-------------|
| 90 –100 | 9.0 –10.0 | O | Outstanding |
| 80-89 | 8.0 –8.9 | D+ | Excellent |
| 75-79 | 7.5 –7.9 | D | Distinction |
| 70-74 | 7.0 –7.4 | A+ | Very Good |
| 60-69 | 6.0 –6.9 | A | Good |
| 50-59 | 5.0 –5.9 | B | Average |

Attendance

Students must have earned 75% of attendance in each course for appearing for the examination. Students with 71% to 74% of attendance must apply for condonation in the prescribed form with prescribed fee. Students with 65% to 70% of attendance must apply for condonation in the prescribed form with the prescribed fee along with the Medical Certificate. Students with attendance lesser than 65% are not eligible to appear for the examination and they shall re-do the course with the prior permission of the Head of the Department, Principal and the Registrar of the University.

Maternity Leave

The student who avails maternity leave may be considered to appear for the examination with the approval of Staff i/c, Head of the Department, Controller of Examination and the Registrar.

Any Other Information

In addition to the above mentioned regulations, any other common regulations pertaining to the UG Programmes are also applicable for this Programme.

**B.Sc. BIO CHEMISTRY
SYLLABUS2023-2024**

| SEMESTER-I | | | | | | | | |
|-----------------------|--|-----------|---|---|-----------|-----|-----|------------|
| Course Code | Course Title | Hours | | | Credits | CIA | ESE | Total |
| | | L | T | P | | | | |
| U23TAL11 | Language 1-Tamil | 3 | 3 | | 3 | 25 | 75 | 100 |
| U23ENL21 | Language 2-English | 3 | 3 | | 3 | 25 | 75 | 100 |
| U23BCT11 | Core 1 Nutritional Biochemistry | 3 | 2 | | 5 | 25 | 75 | 100 |
| U23BCP11 | Core 2 Practical I - Nutritional Biochemistry | | | 5 | 5 | 25 | 75 | 100 |
| U23BCE1A/ U23BCE1B | Elective - I: A – Immunology / B - Bio-molecules and diseases | 2 | 2 | | 3 | 25 | 75 | 100 |
| U23BCS11 | Skill Enhancement Course -1 Life Style Diseases | | 2 | | 2 | 25 | 75 | 100 |
| U23BCF11 | Foundation Course - Human Physiology | | 2 | | 2 | 25 | 75 | 100 |
| Total | | 30 | | | 23 | - | - | 700 |
| SEMESTER-II | | | | | | | | |
| U23TAL12 | Language 1 - Tamil | 3 | 3 | | 3 | 25 | 75 | 100 |
| U23ENL22 | Language 2 - English | 3 | 3 | | 3 | 25 | 75 | 100 |
| U23BCT22 | Core 3: Cell Biology | 3 | 2 | | 5 | 25 | 75 | 100 |
| U23BCP22 | Core 4: Practical II – Cell Biology | | | 5 | 5 | 25 | 75 | 100 |
| U23BCE2A/ U23BCE2B | Elective –II: A - Biochemical Pharmacology / | 2 | 2 | | 3 | 25 | 75 | 100 |

| | | | | | | | | |
|----------|--|-----------|---|--|-----------|----|----|------------|
| | B - Plant Pathology | | | | | | | |
| U23BCS22 | Skill Enhancement Course II Soft Skills | | 2 | | 2 | 25 | 75 | 100 |
| U23BCS23 | Skill Enhancement Course III - Medicinal Diet | | 2 | | 2 | 25 | 75 | 100 |
| | Total | 30 | | | 23 | - | - | 700 |

Non – Major Electives (NME)

The candidates, who have joined the UG Programme should undergo Non - Major Elective offered by other Departments in the respective slot.

- Provide a list of courses to be offered as NME for other Department students

Note:

- Foundation Course: To impart basic knowledge on the intended subject. This Course would focus on Foundational Theories, Concepts, Perspectives, Principles, etc., with respect to the concerned Discipline.

I YEAR: SEMESTER I

NUTRITIONAL BIOCHEMISTRY

| Course Code | Course Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|-------------|---------------------------------------|----------|---|---|---|---|---------|-------------|-------|----------|-------|
| | | | | | | | | | CI A | External | Total |
| U23BCT11 | Core Paper1- Nutritional Biochemistry | Core | 3 | 2 | 0 | 0 | 5 | 5 | 25 | 75 | 100 |

Learning Objectives

The objectives of this course are to

- Create awareness about the role of nutrients in maintaining proper health
- Understand the nutritional significance of carbohydrates, lipids and proteins.
- Understand the importance of a balanced diet.
- Study the effect of additives, emulsifiers, flavour enhancing substances in food.
- Study the significance of nutraceuticals.

Unit I: Concepts of food and nutrition. Basic food groups - energy yielding, body building and functional foods. Units of energy. Calorific and nutritive value of foods. Measurement of Calories by bomb calorimeter. Basal metabolic rate (BMR)- definition, determination of BMR and factors affecting BMR. Respiratory quotient (RQ) of nutrients and factors affecting the RQ. SDA- definition and determination- Anthropometric measurement and indices – Height, Weight, chest and waist circumference BMI. **12 Hrs**

Unit II: Physiological role and nutritional significance of carbohydrates, lipids and protein. Evaluation of proteins by nitrogen balance method- Biological value of proteins- Digestibility coefficient, Protein Energy Ratio and Net Protein Utilization. Protein energy malnutrition – Kwashiorkar and Marasmus, Obesity-Types and preventive measures. **12 Hrs**

Hrs

Unit III: Balanced diet, example of low and high cost balanced diet- for infants, children, adolescents, adults and elderly people. ICMR classification of five food groups and its significance food pyramid. Junk foods - definition and its adverse effects. **12 Hrs**

Unit IV: Food additives: Structure, chemistry, function and application of preservatives, emulsifying agents, buffering agents, stabilizing agents, natural and artificial sweeteners,

bleaching, starch modifiers, antimicrobials, food emulsions, fat replacers, viscosity agents, gelling agents and maturing agents. Food colors, flavors, anti-caking agent, antioxidants. Safety assessment of food additives. **12 Hrs**

Unit V: Nutraceuticals and Functional Foods: Definition, properties and function of Nutraceuticals, food Supplements, dietary supplements prebiotics and probiotics, and functional Foods. Food as medicine. Natural pigments from plants – carotenoids, anthocyanins and its benefits. **12 Hrs**

Course Outcomes

| CO | On completion of this course, students will be able to | Program outcomes |
|-----------|--|-------------------------|
| CO1 | Cognizance of basic food groups viz. Carbohydrates, proteins and lipids and their nutritional aspects as well as calorific value | PO1,PO5 |
| CO2 | Identify and explain nutrients in foods and the specific functions in maintaining health. | PO1 |
| CO3 | Classify the food groups and its significance | PO1,PO2 |
| CO4 | Understand the effect of food additives | PO1,PO2 |
| CO5 | Describe the importance of nutraceuticals and pigments | PO1,PO5,PO6 |

Text books

1. Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd - Bredbenner. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA.
2. M.Swaminadhan (1995) Principles of Nutrition and Dietetics. Bappco.
3. Tom Brody(1998). Nutritional Biochemistry (2nded), Academic press, USA 4.
- Garrow, J S. James WPT and Ralph A (2000). Human nutrition and dietetics (10thed) Churchill Livingstone.
5. Andreas M.Papas (1998). Antioxidant Status, Diet, Nutrition, and Health (1sted) CRC

Reference Books

1. Branen, A.L., Davidson PM &Salminen S. 2001. Food Additives. 2nd Ed. Marcel Dekker.
2. Gerorge, A.B. 1996. Encyclopedia of Food and Color Additives. Vol. III. CRC Press.
3. Advances in food biochemistry, FatihYildiz (Editor), CRC Press, Boca Raton, USA, 2010
4. Food biochemistry & food processing, Y.H. Hui (Editor), Blackwell Publishing, Oxford, UK, 2006.
5. Geoffrey Campbell-Platt. 2009. Food Science and Technology. Wiley-Blackwell, UK.

Web resources

<http://old.noise.ac.in/SecHmscicour/english/LESSON O3.pdf>

<https://study.com/academy/lesson/energy-yielding-nutrients-carbohydratesfat-protein.html>.

<https://www.nhsinform.scot/healthy-living/food-and-nutrition/eatingwell/vitamins-and-minerals>

Mapping with Program Outcomes

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO1 | PSO2 | PSO3 | PSO4 |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO 1 | 3 | | | | 2 | | 3 | 3 | 3 | 3 |
| CO 2 | 3 | | | | | | 3 | 3 | | 3 |
| CO 3 | 3 | 2 | | | | | 3 | 1 | | 3 |
| CO 4 | 3 | 2 | | | | | 3 | 3 | | 3 |
| CO5 | 3 | | | | 2 | 2 | 3 | 3 | | 3 |

S – Strong (3) M-Medium (2) L - Low (1)

PRACTICAL I - NUTRITIONAL BIOCHEMISTRY

| Course Code | Course Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|-------------|---|----------|---|---|---|---|---------|-------------|-------|----------|-------|
| | | | | | | | | | CI A | External | Total |
| U23BCP11 | Core paper 2: Practical 1- Nutritional Biochemistry | Core | 0 | 0 | 5 | 0 | 5 | 5 | 25 | 75 | 100 |

Learning objectives

The objectives of this course are to

- Impart hands-on training in the estimation of various constituents by titrimetric method
- Prepare Biochemical preparations
- Determine the ash content and extraction of lipid

TITRIMETRY

20hrs

1. Estimation of ascorbic acid in a citrus fruit.
2. Estimation of calcium in milk.
3. Estimation of glucose by Benedict's method in honey.
4. Estimation of phosphorous (Plant source)

BIOCHEMICAL PREPARATIONS

15 Hrs

Preparation of the following substances and its qualitative tests

5. Lecithin from egg yolk.
6. Starch from potato.
7. Casein and Lactalbumin from milk.

GROUP EXPERIMENT

10 Hrs

8. Determination of ash content and moisture content in food sample
9. Extraction of lipid by Soxhlet's method.

Course Outcomes

| CO | On completion of this course, students will be able to | Program outcomes |
|-----|--|------------------|
| CO1 | Estimate the important biochemical constituents in the food samples. | PO1, PO3 |
| CO2 | Prepare the macronutrients from the rich sources. | PO1, PO3 |
| CO3 | Determine the ash and moisture content of the food samples | PO1, PO3 |
| CO4 | Extract oil from its sources | PO1, PO3, PO6 |

Text books

1. Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, NewAge International Publishers, 2011,
2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw - Hill Publishing Company Limited, 2001.

Reference books

1. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, NewAge International Publishers, 2016
2. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan.
3. Bowman and Robert M. 2006. Present Knowledge in Nutrition. 9th edition, International Life Sciences Publishers.
4. Indrani TK. 2003. Nursing Manual of Nutrition and Therapeutic Diet, 1st edition Jaypee Brothers medical publishers.
5. Martha H. and Marie A. 2012. Biochemical, Physiological, and Molecular Aspects of Human Nutrition. 3rd edition. Chand Publishers.

Web resources

1. <https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors>
2. <http://rajswasthya.nic.in/RHSDP%20Training%20Units/Lab.%20Tech/Biochemistry/Dr.%20Jagarti%20Jha/Techniques%20In%20Biochemistry%20Lab.pdf>
3. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistrypdf.pdf?sequence=1&isAllowed=y
4. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistrypdf.pdf?sequence=1&isAllowed=y

Mapping with Program Outcomes

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO1 | PSO2 | PSO3 | PSO4 |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO 1 | 3 | | 3 | | | | 3 | 3 | 3 | 3 |
| CO 2 | 3 | | 3 | | | | 3 | 3 | 3 | 3 |
| CO 3 | 3 | | 3 | | | | 3 | 3 | 3 | 3 |
| CO 4 | 3 | | 3 | | | 3 | 3 | 3 | 3 | 3 |

S-Strong(3) M-Medium (2) L-Low (1)

SKILL ENHANCEMENT COURSE -SEC

| FIRST YEAR: SEMESTER I/II Course Code | Course Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---------------------|-------------------|---|---|---|---|---------|-------------|-------|----------|-------|
| | | | | | | | | | CIA | External | Total |
| U23BCS11 | Life Style Diseases | Skill Enhancement | 2 | | - | - | 2 | 2 | 25 | 75 | 100 |

Learning Objectives

The objectives of this course are to

- Create awareness on life style diseases among adolescents.
- List out the lifestyle diseases.
- Explain the common lifestyle diseases and their prevention.
- Acquaint the disorders associated with women’s health.
- Impart life skills so as to prevent lifestyle diseases.

Unit I: Lifestyle diseases: Definition, Factors contributing to lifestyle diseases – Physical inactivity, Poor food habits, disturbed biological clock, sleep deprivation. **6 Hrs**

Unit II: Top lifestyle diseases, Impact of Lifestyle diseases on family, society and economy of country. **6 Hrs**

Unit III: Causes, symptoms, types, preventive measures and treatment of Obesity, cardiovascular diseases, diabetes and cancer. **6 Hrs**

Unit IV: Women’s lifestyle diseases: Polycystic Ovarian Disease, Infertility, Breast and cervical cancer and Osteoporosis. **6 Hrs**

Unit V: Prevention of lifestyle diseases: Balanced diet, sufficient intake of water, physical activity, sleep – wake cycle, stress management and meditation. **6 Hrs**

Course outcomes

| CO | On completion of the course the students will be able to | Program Outcomes |
|-----|--|------------------|
| CO1 | Define Life style diseases and describe the contributing factors | PO1 |
| CO2 | Enumerate the top life style diseases and its impact on life. | PO1, PO4, PO5 |

| | | |
|-----|---|---------------|
| CO3 | Elaborate the treatment and prevention measures of common lifestyle diseases. | PO1, PO4, PO5 |
| CO4 | Highlight the life style diseases that affects the women's health | PO1, PO4, PO5 |
| CO5 | Illustrate the various measures for prevention of life style diseases | PO1, PO4, PO5 |

Textbooks

1. James M R, Life style Medicine, 2nd Edition, CRC Press, 2013
2. Akira Miyazaki, New Frontiers in Lifestyle – Related Disease, Springer, 2008

Reference books

1. Steyn K, Life style and related risk factors for chronic diseases
2. Willett WC, Prevention of chronic disease by means of diet and life style.
3. Kumar M & R. Kumar, Guide to prevention of life style diseases. Deep & Deep publications

Web resources

1. <https://youtu.be/jDdL2bMQXfE>
2. <https://youtu.be/7WnpSB14nDM>
3. <https://youtu.be/ollz9MqtW-U>

Mapping with Program Outcomes

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO1 | PSO2 | PSO3 | PSO4 |
|------|------|------|------|------|------|------|------|------|------|------|
| CO 1 | 2 | | | | | | 3 | 3 | | 3 |
| CO 2 | 2 | | | 2 | 3 | | 3 | 3 | | 3 |
| CO 3 | 2 | | | 2 | 3 | | 3 | 3 | | 3 |
| CO 4 | 2 | | | 2 | 3 | | 3 | 3 | | 3 |
| CO 5 | 2 | | | 2 | 3 | | 3 | 3 | | 3 |

S - Strong(3) M - Medium (2) L - Low (1)

FIRST YEAR: SEMESTER I/II

MEDICINAL DIET

| Course Code | Course Name | Category | | L | T | P | S | Credits | Inst. Hours | Marks | | |
|-------------|----------------|----------|--|---|---|---|---|---------|-------------|-------|----------|-------|
| | | | | | | | | | | CIA | External | Total |
| U23BCS23 | Medicinal Diet | SEC | | 1 | 1 | - | - | 2 | 2 | 25 | 75 | 100 |

Learning Objectives

The main objectives of this course are to

- Provide basic knowledge about diet
- Understand of diet modification for GI diseases
- Plan a diet for liver diseases
- Prepare diet chart for Infectious diseases
- Plan a diet for Diabetes, Renal and Cardio-vascular diseases

Unit-I : Principles of Therapeutic Diet: Definitions of Normal diet, Therapeutic diet, soft Diet and Liquid diet. Objectives of Diet Therapy. Advantages of using normal diet as the basis for Therapeutic diet. Normal Diet-therapeutic modification of normal diet. 6 Hrs

Unit II: Diet modification in Gastrointestinal diseases: Peptic ulcer, Diarrhea, Lactose intolerance, Constipation and Malabsorption syndrome 6 Hrs

Unit III: Diet Modification in liver and gall bladder in diseases: Etiology, symptoms and dietary treatment in jaundice, hepatitis, cirrhosis of liver and hepatic coma. 6 Hrs

Unit IV: Diet Modification in Infectious Diseases: Fevers, Typhoid, Tuberculosis and Viral Hepatitis. Dietary modifications in Tuberculosis. 6 Hrs

Unit V: Diet Modification in Diabetes , Renal and Cardio-vascular diseases-Diabetes, acute & chronic glomerulonephritis, nephrosis, renal failure, kidney stone and Hypertension. 6 Hrs

Course Outcomes

| CO | On completion of this course, students will be able to | Program outcomes |
|-----------|---|-------------------------|
| CO1 | Possess basic knowledge about diet | PO1 |
| CO2 | Sketch diet plan for GI diseases | PO1, PO4, PO5, PO6 |
| CO3 | Sketch diet plan for liver diseases | PO1, PO4, PO5, PO6 |
| CO4 | Sketch a diet plan for Infectious diseases | PO1, PO4, PO5, PO6 |
| CO5 | Prepare diet chart for Diabetes Renaland Cardio-vascular diseases | PO1, PO4, PO5, PO6 |

Text Books

1. M.Raheena Begum ,A Text Book of Foods, Nutrition and Dietetics, Sterling Publishers Pvt.Ltd.
2. M.V.Raja Gopal ,Sumati.R., Mudambi, Fundamentals of foods and Nutrition, Wiley Eastern Limited, Year-1990.
3. William S.R Nutrition and Diet Therapy, 1985, 5thedition, Mosly Co.St.Louis.

Reference books

1. Rodwell Williams Nutrition and Diet Therapy, 1985, the C.V Mosly St.Louis.
2. M.V.Krause & M.A.Mohan ,Food Nutrition and Diet Therapy, 1992 by W.B Saunders Company, Philadelphia, London.
3. Davidson and Passmore, Human Methods and Diabetics, 1976 the English Language Book Society and Churchill.

Web sources

Mapping with Program Outcomes

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO1 | PSO2 | PSO3 | PSO4 |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO 1 | 2 | | | | | | 3 | 3 | | 3 |
| CO 2 | 2 | | | 2 | 3 | 2 | 3 | 3 | | 3 |
| CO 3 | 2 | | | 2 | 3 | 2 | 3 | 3 | | 3 |
| CO 4 | 2 | | | 2 | 3 | 2 | 3 | 3 | | 3 |
| CO 5 | 2 | | | 2 | 3 | 2 | 3 | 3 | | 3 |

S – Strong (3) M - Medium (2) L - Low (1)

Foundation Course

| Course Code | U23BCF11 | HUMAN PHYSIOLOGY | | | |
|---|--|------------------|---|---|---|
| Foundation course | I | L | T | P | C |
| Learning Objective | <ul style="list-style-type: none"> • To learn fundamentals of anatomical structures and physiology of body organs. • To know about the structure and functions of the blood & blood vessels • To understand how the nervous system controls the body parts. • To understand the structure and functions liver and pancreas, respiratory organs, urinary System, endocrine System | | | | |
| Unit I | General Anatomy | | | | |
| Digestion in the mouth, stomach and intestines. Movements of the intestine; Role of Liver and Pancreas – Structure and Functions. | | | | | |
| Unit II | Respiratory System | | | | |
| Structure of Respiratory organs; Sub – divisions of lung air; Chemistry of Respiration. Physiology of the Urinary System- Structure of kidney and nephron; Formation of urine, Skin – Structure and functions, Regulations of body temperature | | | | | |
| Unit III | Endocrine System | | | | |
| Structure and functions of thyroid, pituitary, parathyroid, adrenals, islets of langerhans of pancreas. Reproductive System – anatomy of the male and female reproductive organs; menstrual cycle; mammary glands; Fertilization; Development of Embryo; Pregnancy and parturition | | | | | |
| Unit IV | Nervous System | | | | |
| General classification of nervous system: Structure of nerve cell and Spinal cord; Basic Knowledge of different parts of the brain – anatomy and functions of cerebrum, cerebellum and medulla oblongata. Structure and function of eye and ear; taste, smell and cutaneous sensations. | | | | | |
| Unit V | Blood | | | | |
| Composition and Functions of blood; White Blood Cells – Types and function; Red Blood Cells – Structure and functions; Haemoglobin – Structure and functions, Blood coagulation, Blood group – ABO, Rh. Structure of heart and blood vessels; Properties of cardiac muscle; cardiac cycle; origin and conduction of heart beat; measurement of arterial blood pressure. | | | | | |
| Text Books | 1.Chatterjee C.C, Human Physiology Volume II.CBS publishers, 2020. | | | | |
| References | 1. Sembulingam, K. Essentials of Medical Physiology. 8 th ed. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi; 2019. 2. Best and Taylor. The Physiological Basis for Medical Practice, Wolters Kluwer India Pvt Ltd; 2011. | | | | |

| | |
|--------------------------|--|
| E-References Link | <ol style="list-style-type: none"> https://www.researchgate.net/publication/311934098_introduction_to_human_physiology https://www.wiley.com/enn/Lecture+Notes:+Human+Physiology,+5th+Edition-p-9781405136518 |
|--------------------------|--|

| | | | | | | | | | | | | | | |
|--|--|---|----------|----------|----------|----------|----------|----------|------------|------------------------|----------|----------|----------|--|
| Course outcomes | Upon completion of this course, the students will be able to | | | | | | | | | | | | | |
| | CO | Course Outcomes | | | | | | | | Knowledge Level | | | | |
| | CO1 | understand the function of digestive system and the role of liver and pancreas. | | | | | | | | K1, K2 | | | | |
| | CO2 | learn about respiratory organs and its regulation. | | | | | | | | K1, K2, K3 | | | | |
| | CO3 | acquire knowledge on the importance of endocrine system. | | | | | | | | K1, K2, K3 | | | | |
| | CO4 | explain structure and function of nervous system. | | | | | | | | K1, K2, K3 | | | | |
| | CO5 | learn the composition and functions of blood. | | | | | | | | K1, K2, K3 | | | | |
| Mapping of CO with PO & PSO: | | | | | | | | | | | | | | |
| CO | PO | | | | | | | | PSO | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | |
| CO1 | S | M | S | S | S | S | S | S | S | S | S | M | S | |
| CO2 | S | S | S | S | S | S | S | S | S | S | S | S | S | |
| CO3 | S | S | S | S | M | S | S | S | S | M | S | S | M | |
| CO4 | S | M | S | S | S | S | S | S | S | S | M | S | S | |
| CO5 | S | S | S | M | S | S | S | S | S | S | S | S | S | |
| Strongly Correlating (S) - 3 marks Weakly Correlating (W) - 1 mark Moderately Correlating (M) - 2 marks No Correlation (N) - 0 mark | | | | | | | | | | | | | | |

**FIRST YEAR: SEMESTER II
CELL BIOLOGY**

| Course Code | Course Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|-------------|-----------------------------------|----------|---|---|---|---|---------|-------------|-------|----------|-------|
| | | | | | | | | | CIA | External | Total |
| U23BCT22 | Core paper 3: Cell Biology | Core | 3 | 2 | - | - | 5 | 5 | 25 | 75 | 100 |

Learning Objectives

The main objectives of this course are to

- Provide basic understanding of architecture of cells and its organelles.
- Understand the organization of prokaryotic and eukaryotic genome.
- Educate on the structural organization of bio membrane and transport mechanism
- Impart knowledge on cell cycle, cell division and basics of cells
- Familiarize the concept of mechanism of cell-cell interactions.

Unit I: Architecture of cells- Structural organization of prokaryotic and eukaryotic cells microbial, plant and animal cells. The ultrastructure of nucleus, mitochondria, RER, SER, golgi apparatus, lysosome, peroxisome and their functions **12 Hrs**

Unit II: Cytoskeleton- microfilament, microtubules and intermediary filament- structure, composition and functions. Organization of Genome - prokaryotic, and eukaryotic genome. Organization of chromatin – histones, nucleosome concept, formation of chromatin structure. Special types of chromosomes – lamp brush chromosomes, polytene chromosomes. **12 Hrs**

Unit III: Biomembranes – Structural organization of bilipid layer model and basic functions - transport across cell membranes - uniport, symport and antiport. Passive and active transport. **12 Hrs**

Unit IV: Cellcycle-Definition and Phases of Cell cycle – Cell division – Mitosis and Meiosis and its significance, Cancer cells- definition, types and characteristics of cancer cells. **12 Hrs**

Unit V: Extracellular matrix – Collagen, laminin, fibronectin and proteo glycans- structure and biological role. Structure and role of cadherin, selectins, integrins, Cell -cell interactions- Types-gap junctions, tight junctions and Desmosomes **12 Hrs**

Course Outcomes

| CO | On completion of this course, students will be able to | Programoutcomes |
|-----|---|-----------------|
| CO1 | Explain the structure and functions of basic components of prokaryotic and eukaryotic cells, especially the organelles. | PO1 |
| CO2 | Familiarize the cytoskeleton and chromatin | PO1,PO2 |

| | | |
|-----|---|----------|
| CO3 | Illustrate the structure, composition and functions of cell membrane related to membrane transport | PO1,PO2 |
| CO4 | Elaborate the phases of cell cycle and cell division-mitosis and meiosis and characteristics of cancer cells. | PO1, PO2 |
| CO5 | Relate the structure and biological role of extra cellular matrix in cellular interactions | PO1,PO2 |

Text books

1. Arumugam.N, Cellbiology, Saras publication (10ed, paperback), 2019
2. Devasena T. CellBiology, Oxford University PressIndia - ISBN:9780198075516, 0198075510, 2012
3. Bruce Alberts and Dennis Bray. 2013, Essential Cell Biology. (4thed). Garland Science.

Referencebooks

1. S.C,R.Cell Biology. Newage Publishers -ISBN-10: 8122416888/ISBN-13: 978- 8122416886, 2008
2. Cooper, G.A. The Cell: A Molecular Approach. Sinauer Associates, Inc -ISBN10: 0878931066 /ISBN 13: 9780878931064, 2013
3. E.M.F.,D.R,CellandMolecularBiology.LippincottWilliams&WilkinsPhiladelphia - ISBN: 0781734932 9780781734936, 2006
4. LodishH.A ,Berk C.A, Kaiser M, Krieger M.P, Scott A, Bretscher H, Ploegh and Matsudaira. 2007. Molecular Cell Biology, 6th Edition, WH. Freeman Publishers, New York, USA.

Web resources

1. <https://nicholls.edu/biol-ds/bio1155/Lectures/Cell%20Biology.pdf>
2. <https://www.medicalnewstoday.com/article/320878.php>
3. <https://biologydictionary.net /cell>

Mapping with Program Outcome

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO1 | PSO2 | PSO3 | PSO4 |
|------|------|------|------|------|------|------|------|------|------|------|
| CO 1 | 3 | | | | | | 3 | | | 3 |
| CO 2 | 3 | 3 | | | | | 3 | | | 3 |
| CO 3 | 3 | 3 | | | | | 3 | | | 3 |
| CO 4 | 3 | 3 | | | | | 3 | 3 | | 3 |
| CO5 | 3 | 3 | | | | | 3 | | | 3 |

S – Strong (3)

M - Medium (2)

L - Low (1)

FIRST YEAR: SEMESTER II
PRACTICAL II CELL BIOLOGY

| Course Code | Course Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|-------------|---|----------------|---|---|---|---|---------|-------------|-------|----------|-------|
| | | | | | | | | | CIA | External | Total |
| U23BCP22 | Core paper 4 practical II: Cell Biology | Core practical | - | - | 5 | - | 5 | 5 | 40 | 60 | 100 |

Learning Objectives

The main objectives of this course are to

- Learn the parts of microscope
- Investigate the cells under microscope.
- Image the cells using different stains
- Identify the cells, organelles and stages of cell division
- Identify the spotters

I MICROSCOPY AND STAINING TECHNIQUES

1. Study the parts of light and compound microscope
2. Preparation of Slides and Micrometry
3. Examination of prokaryotic and eukaryotic cell
4. Visualization of animal and plant cell by methylene blue
5. Visualization of nuclear fraction by acetocarmine stain
6. Staining and visualization of mitochondria by Janus green stain

II GROUP EXPERIMENT

7. Identification of different stages of mitosis in onion root tip
8. Identification of different stages of meiosis in onion bulb

III SPOTTERS

9. a) **Cells:** Nerve, Plant and Animal cell
- b) **Organelles:** Mitochondria, Chloroplast, Endoplasmic Reticulum,
- c) **Mitosis stages:** Prophase, Anaphase, Metaphase, Telophase

Course Outcomes

| CO | On completion of this course, students will be able to | Program outcomes |
|-----|--|------------------|
| CO1 | Identify the parts of microscope. | PO1,PO2 |
| CO2 | Preparation of Slides | PO1,PO2 |
| CO3 | Identify the stages of mitosis & meiosis | PO1,PO2 |
| CO4 | Visualize nucleus and mitochondria by staining methods | PO1,PO2 |
| CO5 | Identify the spotters of cells, organelles and stages of cell division | PO1,PO2 |

Text books

1. Rickwood, D and J.R.Harris, Cell Biology: Essential Techniques, Johnwikey1996.
2. Davis, J.M. Basic Cell culture: A practical approach, IRL 1994.
3. Ganesh M.K. and Shivashankara A.R. 2012. Laboratory Manual for Practical Biochemistry Jaypee publications, 2ndEdn.

Referencebooks

- 1) Essential practical handbook of Cell biology, Genetics and Microbiology -A Practical manual- Debarati Das Academic publishers, ISBN, 9789383420599, 1st Edition 2017
- 2) Cellbiology Practical, Dr.Venugupta, ISBN: 8193651219, Prestige publisher, 1st Jan 2018.
- 3) Cell and Molecular biology, DeRobertis, 8th edition, 1st June, 1987

Web resources

1. <http://amrita.olabs.edu.in/?sub=79&brch=18&sim=237&cnt=1>
2. <https://www.microscopemaster.com/organelles.html>
3. <https://www.pdfdrive.com/biochemistry-books.htm>
4. http://medcell.med.yale.edu/histology/cell_lab.php#:~:text=The%20electron%20microscope%20is%20necessary,and%20small%20granules%20and%20vesicles.
5. <http://amrita.olabs.edu.in/?sub=79&brch=18&sim=237&cnt=1>
6. <https://www.khanacademy.org/science/ap-biology/heredity/meiosis-and-geneticdiversity/a/phases-of-meiosis>
7. <https://www.microscopemaster.com/organelles.html>
8. <https://www.pdfdrive.com/biochemistry-books.htm>

Mapping with Program Outcomes:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO1 | PSO2 | PSO3 | PSO4 |
|------|------|------|------|------|------|------|------|------|------|------|
| CO 1 | 2 | 3 | | | | | 3 | 3 | 3 | 3 |
| CO 2 | 2 | 3 | | | | | 3 | 3 | 3 | 3 |
| CO 3 | 2 | 3 | | | | | 3 | 3 | 3 | 3 |
| CO 4 | 2 | 3 | | | | | 3 | 3 | 3 | 3 |

S – Strong (3) M - Medium (2) L - Low (1)

ELECTIVE
IMMUNOLOGY

| Course Code | Course Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|-------------|-----------------------|----------|---|---|---|---|---------|-------------|-------|----------|-------|
| | | | | | | | | | CIA | External | Total |
| U23BCE1A | Elective - Immunology | Elective | 2 | 2 | - | - | 3 | 4 | 25 | 75 | 100 |

Learning Objectives

The objective of this course are to

- Introduce the structure and functions of lymphoid organs and cells of the immune system
- Illustrate the structure and classification of antibodies and adaptive immune response
- Impart knowledge on the types of immunity and uses of vaccines
- Provide an understanding of immune related diseases and transplantation
- Study the Ag-Ab interaction and immunological techniques to identify antigens and antibodies

Unit I: Structure and function of primary lymphoid organs (thymus, bone marrow), secondary lymphoid organs (spleen, lymph node), Cells involved in immune system - Functions- Phagocytosis -Inflammation **15 Hrs**

Unit II: Antigens - Nature, Immunogens, haptens, cross reactions - Immunoglobulin- types- structure and function. Cells involved in antibody formation, Clonal selection theory, Co-operation of T-cell with B-cell. Differentiation of T and B lymphocyte -Humoral and cell mediated immunity. Monoclonal antibody – Production and application in biology. **15 Hrs**

Unit III- Immunity and its types-Innate, Acquired, active and passive - Natural and Artificial - Commonly used toxoid vaccines, killed vaccines, live attenuated vaccines, rDNA Vaccines, DNA and subunit vaccines **15 Hrs**

Unit IV: Hypersensitivity – Immediate (Type 1) and Delayed (Type IV), Auto- immune diseases with examples. Organ specific and systemic autoimmunity. SLE, RA. Transplantation – Types of Grafts, structure& functions of MHC, graft Vs host reaction, immunosuppressive Agents. **15 Hrs**

Unit V: Antigen-antibody reactions, General features of Antigen Antibody reactions. Precipitation, Immuno diffusion, SID and DID -Oudin Procedure, Oakley Fulthrope Procedure, Radio immunodiffusion, Ouchterlony double diffusion, CIE, Rocket electrophoresis, Agglutination- Coomb's test Complement Fixation test-Wasserman's reaction, RIA, ELISA. **15 Hrs**

Course Outcomes

| CO | On completion of this course, students will be able to | Programoutcomes |
|-----|---|-----------------|
| CO1 | Associate structure and function of the organs involved in our body's natural Defence | PO1 |
| CO2 | Classify antigens and antibodies and the role of lymphocytes in defending the host | PO1, PO2 |
| CO3 | Describe the types of immunity and the uses of vaccines | PO1, PO4 |
| CO4 | Understand the immune related diseases and mechanism of transplantation | PO1, PO2 |
| CO5 | Examine the immunological tests and relate it to the immune status of an Individual | PO1, PO3 |

Text Books

1. Kuby, J. (2018). Immunology (5th ed). W.H. Freeman - ISBN-10: 1319114709 / ISBN-13: 978-1319114701
2. Rao, C. V. (2017). Immunology (3rd ed.). Chennai: Alpha Science Int. Ltd - ISBN-10: 1842652559/ ISBN 13:978-1842652558
3. Tizard (1995). An Introduction to Immunology. Harcourt Brace College Publications

References Books

1. Kenneth M. Murphy, Paul Travers, Mark Walport - (2007), Janeway's Immunobiology, 7th edition, Garland Science.
2. Abul K. Abbas, Andrew H. Lichtman, Jordan S. Pober - (1994), Cellular and molecular immunology, 2nd edition, B. Saunders Company.
3. Basic Immunology Functions and Disorders of the Immune System, 6th Edition - January 25, 2019 Authors: Abul Abbas, Andrew Lichtman, Shiv Pillai, ISBN: 9780323549431 eBook ISBN: 9780323639095
4. Peter Delves, Seamus Martin, Dennis Burton, Ivan Roitt - (2006), Roitt's Essential Immunology, 11th edition, Wiley-Blackwell

Web resources

1. https://onlinecourses.nptel.ac.in/noc22_bt40/preview
2. https://onlinecourses.swayam2.ac.in/cec20_bt05/preview
3. <https://youtu.be/8uahFP16ny8>

Mapping with ProgramOutcomes

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO1 | PSO2 | PSO3 | PSO4 |
|------|------|------|------|------|------|------|------|------|------|------|
| CO 1 | 3 | | | | | | 3 | | | 3 |
| CO 2 | 3 | | 2 | | | | 3 | | | 3 |
| CO 3 | 3 | | | 2 | | | 3 | 3 | | 3 |
| CO 4 | 3 | 2 | | | | | 3 | 1 | | 3 |
| CO 5 | 3 | | 3 | | | | 3 | 3 | 3 | 3 |

S – Strong (3) M - Medium (2) L - Low (1)

| Course Code | U23BCE1B | BIO-MOLECULES AND DISEASES | | | | L | T | P | C |
|--|---|----------------------------|--|--|--|---|---|---|---|
| Elective | | | | | | 2 | 2 | - | 3 |
| Learning Objective | <ul style="list-style-type: none"> To understand the lifestyle disease due to imbalance of metabolism To know the fundamental principles and disease causing by hormonal imbalance and nutritional deficiency | | | | | | | | |
| Unit I | Inborn errors of metabolism | | | | | | | | |
| Alkaptonuria, Phenylketonuria, Glycogen and Lipid storage diseases, SCID, Clotting disorders | | | | | | | | | |
| Unit II | Nutritional deficiency: | | | | | | | | |
| Nutritional deficiency based diseases Kwashiorkor, Marasmus, Beri-beri, Pellagra, Scurvy, Anaemia, Night blindness, Rickets, Osteomalacia, Osteoporosis, Wilson's disease. | | | | | | | | | |
| Unit III | Lifestyles disease: | | | | | | | | |
| Obesity, Cardiovascular diseases, Atherosclerosis, Diabetes mellitus-II. Inflammatory Bowel Disease (IBD). | | | | | | | | | |
| Unit IV | Hormonal Imbalances: | | | | | | | | |
| Outline of hormone action and imbalances leading to disease - precocious puberty, hyper and hypopituitarism. Hyper and hypothyroidism. | | | | | | | | | |
| Unit V | Diseases caused due to misfolded proteins: | | | | | | | | |
| Alzheimer's, Huntington's disease, Kuru, Creutzfeldt - Jakob disease, Sickle cell anaemia, Thalassemia. | | | | | | | | | |

| | | | | | | | | | | | | | |
|--|---|---|----------|----------|----------|----------|----------|----------|------------------------|----------|----------|----------|----------|
| Text Books | <ol style="list-style-type: none"> 1. K. Ramadevi, Ambika Shanmugam, Fundamentals of Biochemistry for Medical students 8th Edition, Wolters kluwer India Pvt Ltd, 2016. 2. U. Satyanarayana & U. Charapani. Essentials of Biochemistry, Books & Allied Pvt Ltd. 2019. | | | | | | | | | | | | |
| References | <ol style="list-style-type: none"> 1. Nanda Maheswari, Clinical Biochemistry Jaypee Brothers Medical Publishers, 2016. 2. John. E. Hall, Guyton & Hall Text book of Medical Physiology, Elsevier, Health, 2017. 3. Rajinder Chawla, Tarek. H. E, Metwally Sucherda sahu, Text book of Medical Biochemistry Wolters Kluwer India, Pvt, Ltd, 2nd Edition, 2017. 4. Allan Gaw, Clinical chemistry, Churchill Living Stone, 2018. 5. Michael Murphy, Rajeer Srivastava, Kevin Deans, Clinical Biochemistry, Elsevier, 2018. | | | | | | | | | | | | |
| E-Referenc esLink | <ol style="list-style-type: none"> 1. https://pubmed.ncbi.nlm.nih.gov/11843698/ 2. https://www.nature.com/articles/gim200166 | | | | | | | | | | | | |
| Course outcomes | Upon completion of this course, the students will be able to | | | | | | | | | | | | |
| | CO | Course Outcomes | | | | | | | Knowledge Level | | | | |
| | CO1 | understand the inborn errors of metabolism. | | | | | | | K1, K2 | | | | |
| | CO2 | acquire information on nutritionally deficiency disease and its importance. | | | | | | | K1, K2, K3 | | | | |
| | CO3 | learn the importance of diet in lifestyle disease. | | | | | | | K1, K2, K3 | | | | |
| | CO4 | understand the disorders related to hormonal imbalance. | | | | | | | K1, K2, K3 | | | | |
| | CO5 | acquire knowledge on genetics disease and its inheritance. | | | | | | | K1, K2, K3 | | | | |
| Mapping of CO with PO & PSO | | | | | | | | | | | | | |
| CO | POs | | | | | | | | PSOs | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 |
| CO1 | S | M | S | S | S | M | S | S | S | S | S | M | S |
| CO2 | S | S | S | S | S | S | S | S | S | S | S | S | S |
| CO3 | S | S | S | S | M | S | S | S | S | M | S | S | M |
| CO4 | M | S | S | S | S | S | S | S | S | S | S | S | S |
| CO5 | S | S | S | S | S | S | S | S | S | S | S | S | S |
| Strongly Correlating (S) - 3 marks Weakly Correlating (W) - 1 mark Moderately Correlating (M) - 2 marks No Correlation (N) - 0 mark | | | | | | | | | | | | | |

BIOCHEMICAL PHARMACOLOGY

| Course Code | Course Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|-------------|---|----------|---|---|---|---|---------|-------------|-------|----------|-------|
| | | | | | | | | | CIA | External | Total |
| U23BCE2A | Elective -Biochemical Pharmacology | Elective | 2 | 2 | - | - | 3 | 4 | 25 | 75 | 100 |

Learning Objectives

The objectives of this course are to

- Introduce the basic concepts of pharmacology.
- Explain the metabolism of drugs and factors responsible for metabolism.
- Acquaint the adverse response and side effects of drugs.
- Familiarize important drugs used for common metabolic disorders.
- Provide an understanding about the action of antibiotics.

Unit I: Drugs – classification based on sources, routes of drug administration - Oral/Enteral, Parenteral and Local application. Absorption of drugs, factors influencing drug absorption, distribution and excretion of drugs. **15 Hrs**

Unit II: Drug metabolism - Phase I and Phase II reactions, role of cytochrome P₄₅₀, non-microsomal reactions of drug metabolism. Factors influencing drug metabolism. Therapeutic index. **15 Hrs**

Unit III: Drug allergy, Drug tolerance - IC₅₀, LD₅₀ of a drug, Drug intolerance, Drug addiction, Drug abuses and their biological effects. Drug resistance - biochemical mechanism. **15 Hrs**

Unit IV: Therapeutic Drugs - Analgesics and Non-steroidal anti-inflammatory drugs (NSAIDs) – Aspirin and Acetaminophen. Insulin, Oral antidiabetic drugs - Sulfonylureas, Biguanides. Antihypertensive drugs - ACE inhibitors, Calcium channel blockers. Anti-cancer agents – Antimetabolites. **15 Hrs**

Unit V: Antibiotics - Definition, Examples and Biochemical mode of action of penicillin, streptomycin, tetracyclines and chloramphenicol. **15 Hrs**

Course Outcomes

| CO | On completion of this course, students will be able to | Program outcomes |
|-----|---|------------------|
| CO1 | Classify the different routes of drug administration, describe the absorption, distribution, metabolism and excretion of drugs. | PO1 |
| CO2 | Illustrate the metabolism of drugs, classify the microsomal and non-microsomal reactions and explain the role of cytochromes. | PO1 |
| CO3 | List out the various adverse response and side effects of drugs. | PO1, PO2, PO4 |
| CO4 | Justify the use of synthetic drugs and elucidate its pharmacological actions and its adverse effects for different disease. | PO1, PO4 |
| CO5 | Highlight the importance and explain the mode of action of important antibiotics. | PO1,PO4 |

Text Books

1. N.Murugesh, A concise text book of Pharmacology –Sathya Publishers.
2. Jayashree Ghosh, A Textbook of Pharmaceutical chemistry –S. Chand & Company Ltd.
3. S C Metha, Ashutosh Kar, Pharmaceutical Pharmacology –New Age International (P) Limited, Publishers.

References Books

1. Lippincott's illustrated Reviews- Pharmacology by Mary J.Mycek, Richard A.Harvey, Pamela C. Champe, Lippincott – Raven publishers, New Delhi.
2. David. E. Golan, Principles of Pharmacology, Wolters Kluwer (India) Pvt.Ltd.
3. R.S. Satoskar, S. B. Elsevier Pharmacology and pharmacotherapy. - ISBN-10: 9788131248867 / ISBN-13: 978-8131248867 ,2017.
4. Tripathi, K.Essentials of Medical Pharmacology. Jaypee Publishers- ISBN-10: 9350259370 / ISBN-13: 978-9350259375.2018.

Web Resources

<https://slideplayer.com/slide/3728296/64/video/What+is+bioremediation%3F.mp4>

Mapping with Program Outcomes

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO1 | PSO2 | PSO3 | PSO4 |
|------|------|------|------|------|------|------|------|------|------|------|
| CO 1 | 3 | | | | | | 3 | | | 3 |
| CO 2 | 3 | | | | | | 3 | | | 3 |
| CO 3 | 3 | 2 | | 2 | | | 3 | 2 | | 3 |
| CO 4 | 3 | | | 2 | | | 3 | 2 | | 3 |
| CO 5 | 3 | | | 2 | | | 3 | 2 | | 3 |

S – Strong (3) M - Medium (2) L - Low (1)

| Course Code | U23BCE2B | PLANT PATHOLOGY | | | |
|--|---|------------------------|----------|----------|----------|
| Elective | | L | T | P | C |
| Learning objective | <ul style="list-style-type: none"> • To learn plant diseases Classification and defense mechanisms in Plants • To know the methods of assessment of disease incidence and disease severity • To gain knowledge on principles and methods of plant disease control. | | | | |
| Unit I | History and development of Plant Pathology Disease concept in plants: | | | | |
| Disease classification, Causal factors - biotic and abiotic, disease diagnosis, Koch's postulates. Defense Mechanism in plants: Structural and Biochemical. | | | | | |
| Unit II | Epidemiology: | | | | |
| Traditional and modern concepts of disease triangle, Role of host, pathogen and environment in disease development. Aerobiology in relation to Epidemiology. Methods of monitoring splash borne and airborne inoculum. | | | | | |
| Unit III | Assessment of disease: | | | | |
| Methods of assessment of disease incidence and disease severity and estimation of yield loss. Study of plant diseases of major crops in India caused by fungi, bacteria, and viruses. (with reference to symptoms, etiology and control) | | | | | |
| Unit IV | Plant diseases: | | | | |
| Study of importance, symptoms, causal organism, disease cycle and control of diseases of crop plants. Rots diseases with special reference to fruit and stem end rot of papaya. Damping off of seedlings of crop plants. Downy mildews of cucurbits. | | | | | |
| Unit V | Principles and methods of plant disease control: | | | | |
| Control through regulatory methods: Plant quarantine. Cultural and biological methods of control. Control through physical means. Chemical method for plant disease control: Fungicides, chemotherapy. Use of resistant varieties. | | | | | |
| Text Books | <ol style="list-style-type: none"> 1. P. D. Sharma, Environmental Botany and Plant Pathology, Publisher, Rastogi,2015 2. R.S. Mehrotra, Ashok Aggarwal ,John William Harshberger, Mycology and Plant pathology, Publisher McGraw Hill Education, 2015 | | | | |
| References | <ol style="list-style-type: none"> 1. Chaube H.S. Introductory plant pathology, Publisher CBS,2017 2. Stephen Burchett, Sarah Burchett, Plant Pathology, Garland Science,2017 | | | | |

| | |
|--------------------------|--|
| E-References link | 1. http://ceventura.ucanr.edu/Environmental_Horticulture/Landscape/Problems/Pathology/ 2. https://phytopath.ca/education/what-is-plant-pathology/ |
|--------------------------|--|

| | | | | | | | | | | | | | |
|--|--|---|----------|----------|----------|----------|----------|----------|------------------------|----------|----------|----------|----------|
| | 3. https://cropwatch.unl.edu/soybean-management/plant-disease 4. https://www.saferbrand.com/advice/plant-disease-library | | | | | | | | | | | | |
| Course outcomes | Upon completion of this course, the students will be able to | | | | | | | | | | | | |
| | CO | Course Outcomes | | | | | | | Knowledge Level | | | | |
| | CO1 | know the concept of plant diseases and its classification | | | | | | | K1 | | | | |
| | CO2 | understand the epidemiology of plant diseases | | | | | | | K1, K2 | | | | |
| | CO3 | attain knowledge on plant diseases of major crops in India | | | | | | | K1, K2 | | | | |
| | CO4 | understand disease cycle and control of diseases of crop plants | | | | | | | K2 | | | | |
| | CO5 | learn the Principles and methods of plant disease control | | | | | | | K2 | | | | |
| Mapping of CO with PO & PSO | | | | | | | | | | | | | |
| CO | PO | | | | | | | | PSO | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 |
| CO1 | S | M | S | S | S | S | M | S | S | S | S | M | S |
| CO2 | S | S | S | M | S | M | S | M | S | S | S | S | S |
| CO3 | S | S | M | S | M | S | S | M | S | M | S | M | M |
| CO4 | S | M | S | S | S | M | M | S | S | S | M | S | S |
| CO5 | S | S | M | M | S | S | S | S | M | M | S | M | S |
| Strongly Correlating (S) - 3 marks Moderately Correlating (M) - 2 marks Weakly Correlating (W) - 1 mark No Correlation (N) - 0 mark | | | | | | | | | | | | | |