

B. Sc., BIOCHEMISTRY

SYLLABUS

Programme Code : 3USBIC

2021-2024



**SENGAMALA THAYAAR EDUCATIONAL TRUST
WOMEN'S COLLEGE (AUTONOMOUS)**

(Affiliated to Bharathidasan University, Tiruchirappalli)
(Accredited by NAAC) | (An ISO 9001:2015 Certified Institution)

**Sundarakkottai, Mannargudi – 614 016,
Thiruvarur (Dt.), Tamil Nadu, India.**



SENGAMALA THAYAR EDUCATIONAL TRUST

WOMEN'S COLLEGE (AUTONOMOUS)

(Affiliated to Bharathidasan University)

(Accredited by NAAC; An ISO 9001:2015 Certified Institution)

SUNDARAKKOTTAI, MANNARGUDI – 614016.

TAMILNADU, INDIA.

B.Sc., BIOCHEMISTRY COURSE STRUCTURE UNDER CBCS

(For the candidates admitted in the academic year 2021–2022)

ELIGIBILITY: Those who have completed +2 examinations with Chemistry and Biology as two of the core Subjects

Sem.	Part	Nature of the Course	Course Code	Title of the Course	Inst. Hour/Week	Credit	Exam Hours	Marks		
								CIA	ESE	Total
I	I	Language Course (LC)-I-Tamil*/Other Languages ** #	21LC101	Ikkala Ilakkiyam	6	3	3	25	75	100
	II	English Language Course (ELC) – I	21ELC101	Language through Literature I (Prose and Communication Skills)	6	3	3	25	75	100
	III	Core Course (CC)-I	21BC101	Fundamentals of Biochemistry	6	6	3	25	75	100
		Core Practical (CP) -I	21BC102P	Fundamentals of Biochemistry Practical	3	2	3	40	60	100
		Allied Course (AC)-I	21ACH101	Allied Chemistry I	4	3	3	25	75	100
	IV	Allied Practical (AP)-I	21ACH102P	Allied Chemistry Practical-I	3	2	3	40	60	100
	IV	Value Education		Value Education	2	2	3	25	75	100
TOTAL					30	21	-	-	-	700
II	I	Language Course (LC) –II-Tamil*/ Other Languages ** #	21LC201	Idaikkala Ilakkiyamum Pudhinamum	6	3	3	25	75	100
	II	English Language Course (ELC)-II	21ELC201	Language through Literature II (Poetry and Communication Skills)	6	3	3	25	75	100
	III	Core Course (CC)-II	21BC203	Analytical Techniques	6	6	3	25	75	100
		Core Practical (CP) -II	21BC204P	Analytical Techniques Practical	3	2	3	40	60	100
		Allied Course (AC)-II	21ACH203	Allied Chemistry- II	4	3	3	25	75	100
	IV	Allied Practical (AP)-II	21ACH204P	Allied Chemistry Practical- II	3	2	3	40	60	100
	IV	Environmental Studies	-	Environmental Studies	2	2	3	25	75	100
TOTAL					30	21	-	-	-	700
III	I	Language Course (LC) -III Tamil*/Other Languages ** #	22LC301	Kaappiyamum Naadakamum	6	3	3	25	75	100
	II	English Language Course (ELC)-III	22ELC301	Language through Literature III (Drama and Communication Skills)	6	3	3	25	75	100
	III	Core Course (CC) -III	22BC305	Human Physiology	6	5	3	25	75	100
		Core Practical (CP)-III	22BC306P	Human Physiology Practical	3	2	3	40	60	100
		Allied Course (AC)-III	22ABC301	Biology	4	3	3	25	75	100
	IV	Allied Practical (AP)-III	22ABC302P	Biology Practical	3	2	3	40	60	100

Sem.	Part	Nature of the Course	Course Code	Title of the Course	Inst. Hour/Week	Credit	Exam Hours	Marks			
								CIA	ESE	Total	
	IV	Non Major Elective I- for those who studied Tamil under Part-I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	-	-	2	2	3	25	75	100	
		TOTAL			30	20	-	-	-	700	
IV	I	Language Course (LC) -IV - Tamil*/Other Languages **	22LC401	Pandaiya Ilakkiyam	6	3	3	25	75	100	
	II	English Language Course(ELC) -IV	22ELC401	Language through Literature IV (Short stories and Communication Skills)	6	3	3	25	75	100	
	III	Core Course (CC) -IV		22BC407	Enzymes	5	4	3	25	75	100
		Core Practical (CP)-IV		22BC408P	Enzymes Practical	3	2	3	40	60	100
		Allied Course (AC)-IV		22ABC403	Cell Biology	3	3	3	25	75	100
		Allied Practical (AP)-IV		22ABC404P	Cell Biology Practical	3	2	3	40	60	100
	IV	Non Major Elective (NME)-II- for those who studied Tamil under Part I a). Basic Tamil for other language students b). Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	-	-	2	2	3	25	75	100	
		Skill Based Elective (SBE) - I	22SBEB1	Traditional Medicine	2	2	3	25	75	100	
		TOTAL			30	21	-	-	-	800	
	V	III	Core Course (CC) -V		23BC509	Metabolism	6	5	3	25	75
Core Course (CC) -VI			23BC510	Molecular Biology	5	5	3	25	75	100	
Core Course (CC)-VII			23BC511	Endocrinology	5	5	3	25	75	100	
Core Practical (CP)-V			23BC512P	Metabolism and Molecular Biology Practical	3	3	3	40	60	100	
IV		Major Based Elective (MBE)-I		23MBEBC1	Microbial Biochemistry	5	4	3	25	75	100
		Skill Based Elective (SBE)- II		23SBEB2	Phytotherapeutics	2	2	3	25	75	100
		Skill Based Elective (SBE)- III		23SBEB3	Herbal Cosmetics	2	2	3	25	75	100
		Soft Skills Development		23UGSDC	Soft Skills Development	2	2	3	25	75	100
	TOTAL			30	28	-	-	-	800		
VI	III	Core Course (CC)-VIII		23BC613	Immunology	6	6	3	25	75	100
		Core Course (CC)-IX		23BC614	Clinical Biochemistry	6	6	3	25	75	100
		Core Practical (CP)-VI		23BC615P	Clinical Biochemistry and Immunology Practical	6	5	3	40	60	100
		Core Project (CP)-X		23BCPW	Group Project	6	6	3	25	75	100
		Major Based Elective (MBE)-II		23MBEBC2	Pharmaceutical Biochemistry	5	4	3	25	75	100
	V	Extension Activities		-	**Extension Activities	1	2	3	25	75	100
		Gender Studies		23UGGS	-						
	TOTAL			30	29	-	-	-	600		
G. TOTAL					180	140	-	-	-	4300	

CURRICULUM DESIGN
LIST OF ALLIED COURSES

ALLIED COURSE I-CHEMISTRY

ALLIED COURSE II-BIOLOGY

Subject	No. of Courses	Total Credits
Language Part – I	4	12
English Part –II	4	12
Core Course	9	49
Core Practical	6	15
Allied Course	4	12
Allied Practical	4	08
Non-Major Elective	2	04
Skill Based Elective	3	06
Major Based Elective	2	08
Core Project	1	06
Environmental Studies	1	02
Value Education	1	02
Soft Skill Development	1	02
Gender Studies	1	01
Extension Activities	-	01 (Credit only)
Total	43	140

* For those who studied Tamil upto 10th +2 (Regular Stream);

+ Syllabus for other Languages should be on par with Tamil at degree level;

those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV;

** Extension Activities shall be outside instruction hours.

Note:

	CIA	ESE
1. Theory	25	75
2. Practical	40	60
3. Project	25	75

Separate passing minimum is prescribed for CIA and ESE

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for ESE shall be 40% out of 75 marks [i.e.30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for ESE shall be 40% out of 60 marks [i.e. 24marks]

**NON MAJOR ELECTIVE (NME) OFFERED BY
THE DEPARTMENT**

Semester	Part	Nature of the Course	Course Code	Title of the Course
III	IV	NME -I	22NMEBC31	Health and Diseases
IV	IV	NME-II	22NMEBC42	Health Education and Community Pharmacy

**SKILL BASED ELECTIVE (SBE) OFFERED BY
THE DEPARTMENT (PHYTOMEDICINE)**

Semester	Part	Nature of the Course	Course Code	Title of the Course
IV	IV	SBE-I	22SBEBEC1	Traditional Medicine
V	IV	SBE-II	23SBEBEC2	Phytotherapeutics
V	IV	SBE-III	23SBEBEC3	HerbalCosmetics

SEMESTER I

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: I-CC-I: Fundamentals of Biochemistry

Ins. Hrs./Week: 6

Course Credit: 6

Course Code: 21BC101

OBJECTIVES

- To expose the importance of biological macromolecules
- To study the influence and role of structure in reactivity of biomolecules
- To understand the role of biomolecules and their functions

UNIT- I: Carbohydrates (19 Hours)

Carbohydrates- Definition, classification, structure, properties and functions of biologically important carbohydrates viz. monosaccharide (glucose, fructose and galactose), Disaccharides – (sucrose, lactose and maltose) and homo and hetero polysaccharides- starch, glycogen, inulin, cellulose, chitin, hyaluronic acid, chondroitin sulfate and heparin. Interconversion of sugars.

UNIT –II: Proteins (20 Hours)

Definition, classification, structure, properties and functions of amino acids; Peptides and peptide bond. Proteins- Definition, classification, properties, Biological importance. Structure of proteins- primary structure, secondary, tertiary and quaternary structure; forces stabilizing the structure of proteins. Super secondary structure of proteins.

UNIT –III: Lipids (18 Hours)

Fatty acids - Definition, nomenclature, classification, properties and biological significance. Lipids- Definition, classifications properties and biological functions. Simple lipids: oils and waxes. Compound lipids- Definition, properties, structure and functions- Phospholipids, sphingolipids and glycolipids. Lipoproteins – classification and composition. Derived lipids- Definition, properties, structure and functions of steroids. Prostaglandin- Classification, properties, structure and functions.

UNIT- IV: Nucleicacid (17 Hours)

Definition, components of mono nucleotides- bases (pyrimidines, purines), nucleosides, nucleotides. nucleoside. Properties -Denaturation and Renaturation. Polynucleotides- DNA- Definition, properties, composition, structure and biological importance. RNA- Definition, classifications (mRNA, tRNA and rRNA), structure, properties and biological importance.

UNIT –V: Vitamins and Minerals (16 Hours)

Definition and classification, source, structure, properties, daily requirement, deficiency manifestation and biological role of the fat soluble vitamins (A, D, E and K) and water soluble vitamins (C, B1, B2, B3, B5, B6, B9 and B12). Mineral requirements-essential macro minerals- sodium, potassium, calcium, phosphorus and micro minerals- zinc, chromium, iron, selenium- sources and functions.

Total Lecture Hours- 90

COURSE OUTCOME

The students will be able to,

1. Understand the structure, classification, biological functions and properties of carbohydrates
2. Learn the structure of amino acids, and classification, properties and biological functions of proteins.
3. Acquire comprehensive knowledge on structure, classification, nomenclature and functions of lipids.
4. Learn the different types of nucleic acids, their structure and their biological significance.
5. Understand nutrients requirements and the importance of various kinds of vitamin, their sources important biological functions.

TEXT BOOK(S)

1. Deb AC. 2016. Fundamentals of Biochemistry. 7th edition, NCBA Publishers, New Delhi.
2. Jain JL, Sunjay Jain and Nitin Jain. 2018. Fundamentals of Biochemistry. Updated edition. 2020. S.Chand Publishers, New Delhi.
3. Poonam Agarwal. 2020. Review of Biochemistry. 5th edition. CBS Publishers, New Delhi.
4. Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 2003. Harper's Illustrated Biochemistry, 26th edition, McGraw-Hill Medical Publishers, New York.
5. Vasudevan DM. 2018. Biochemistry. 9th edition. Aypee Brothers Medical Publishers, New Delhi.

REFERENCE BOOK(S)

1. Anders Liljas. 2019. Textbook of Structural Biology, 2nd edition, World Scientific Publishers, Singapore.
2. Berg JM., Tymoczko JL and Stryer L. 2019. Biochemistry, 9th edition, WH. Freeman Publishers, New York.
3. David L. Nelson and Michael M. Cox. 2017. Lehninger Principles of Biochemistry, 7th edition, WH Freeman Publishers, New York.
4. Lehninger AL, Nelson DL and Cox MM. 2020. Principles of Biochemistry, 8th edition. WH Freeman Publishers, New York.
5. Satyanarayana U and U. Chakrapani. 2020. Biochemistry, 5th Updated edition, Elsevier Publishers, India.

E-RESOURCES

1. <http://www1.biologie.uni-hamburg.de/b-online/library/biology107/bi107vc/fa99/terry/sugars.html>
2. <https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod10.pdf>
3. <https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod11.pdf>
4. <https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod12.pdf>
5. <https://www.pdfdrive.com/biochemistry-books.html>

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: I-CP-I: Fundamentals of Biochemistry Practical

Ins. Hrs./Week: 3

Course Credit: 2

Course Code: 21BC102P

OBJECTIVES

- To acquire hands on training in quantitative and qualitative analytical techniques

Practicals

1. Safety measures in Laboratories
2. Use of analytical balance and weighting.
3. Preparation & Standardization of laboratory reagents.
4. Calibration of volumetric glass wares (Burette, pipette and measuring cylinder).
5. Handling of Microscope.

QUALITATIVE ANALYSIS

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Galactose, Maltose, Sucrose, Lactose).
2. Qualitative analysis of amino acids (Tryptophan, Tyrosine, Arginine, Proline, Phenyl alanine, Methionine and Histidine)
3. Qualitative analysis of Lipids-Coconut oil, Gingelly oil

QUANTITATIVE ANALYSIS

1. Estimation of reducing sugar by Benedict's quantitative method.
2. Estimation of amino acid by formal titration
3. Estimation of ascorbic acid by titrimetric method using 2,6 - dichlorophenol indophenol.
4. Determination of acid number of edible oil.
5. Determination of saponification number of edible oil.

COURSE OUTCOME

Student are able to

- Familiar with analytical instruments
- Get trained in quantitative and qualitative analytical techniques

TEXT BOOK(S)

1. Anil Kumar, Sarika Garg and Neha Garg, 2012. Biochemical Tests – Principles and Protocols, 1st edition, Vinod Vasishtha Viva Publishers, New Delhi.
2. Jayaraman J. 2011. Manuals in Biochemistry, 1st edition, New Age International Publishers, New Delhi.
3. Pattabiraman TN. 1998. Laboratory Manual in Bio Chemistry – 3rd edition, All India Publishers, Chennai.
4. Sadasivam S and Manickam VA. 2006. Biochemical methods, 3rd edition, New Age international Publishers, New Delhi.
5. Varun Kumar Malhotra, 1996. Practical Biochemistry for students. 4th edition, Jaypee Brothers Medical Publishers, New Delhi.

REFERENCE BOOK(S)

1. Homie DJ and Peck H. 2003. Analytical Biochemistry, 1st edition, Longman group – Rastogic CBS Publishers, New Delhi.
2. Keith Wilson and John Walker, 2015. Principles and Techniques of Practical Biochemistry, 6th edition, Cambridge University press Publishers, USA.
3. Plummer T. 2001. Practical Biochemistry, 3rd edition, McGraw Hill Publishing Company, New York.
4. Sawhney SK, Randhir Singh, 2005. Introductory Practical Biochemistry, 2nd edition, Alpha Science International Limited, United Kingdom.
5. Sergio Caroli and Zyula, 2017. Analytical Techniques for Clinical Chemistry, 1st edition, John Wiley & Sons Inc Publishers, New York.

E-RESOURCES

1. <https://www.pdfdrive.com/principals-and-techniques-of-biochemistry-and-molecular-biology-7th-e18725198.html>
2. <https://www.pdfdrive.com/practical-textbook-of-biochemistry-for-medical-students-e187182647.html>
3. <https://www.pdfdrive.com/introduction-to-practical-biochemistry-e33418060.html>
4. <https://www.pdfdrive.com/practical-biochemistry-e187196416.html>
5. <https://www.pdfdrive.com/introduction-to-practical-biochemistry-e33418060.html>

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DEPARTMENT OF CHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: I-AC-I: Allied Chemistry I

Ins. Hrs./Week: 4 Course Credit: 3 Course Code: 21ACH101

OBJECTIVES

- To understand the industrial chemistry and various Preparation of drugs.
- To study the various concepts of resonance and halogen compounds.
- To study the properties of aromatic compounds and organic reactions.

UNIT- I: Industrial Chemistry (11 Hours)

Industrial Chemistry: Fuel gases – Water gas – producer gas – LPG gas – Gobargas and natural gas. Fertilizers – NPK and mixed Fertilizers – soaps and detergents. Cumene process for phenol manufacturing ; Manufacturing of Paracetamol, Chlorophenicol – Preparation of Shampoo.

UNIT- II: Electron Displacement Effects and Halogen Compounds (13 Hours)

Polar effects: Inductive effect – Resonance – Condition for resonance. Consequences of resonance – resonance of energy. Basic property of aniline and acidic property of phenol. Hyperconjugation – Heat of hydrogenation - Bond length and dipole moment – Steric effect. Halogen containing compounds: Important chlorohydrocarbons used as solvents. Pesticides – Dichloromethane – chloroform – carbon tetrachloride – DDT and BHC Types of solvents - Polar, Nonpolar.

UNIT - III : Aromatic Compounds and Organic Reactions (13 Hours)

Aromatic compounds: Structure, stability resonance and aromaticity of benzene. Substitution reaction: Nitration, Halogenations, Alkylation. Naphthalene – Isolation, properties and uses. Organic reaction: Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen and Haloform reactions. Chemotherapy: Explanation with two examples each for analgesics, antibacterial, anti-inflammatory, antibiotics, antiseptic and disinfectant, anesthetics local and general (Structure not necessary)

UNIT – IV: Solid State, Energetics and Phase Rule Reactions (12 Hours)

Solid state: Typical crystal lattices- unit cell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices. Energetics: First law of thermodynamics – state and path function – need for the second law – Carnot's cycle and thermo-dynamic scale of temperature, spontaneous and Non-spontaneous processes – entropy – Gibbs free energy. Phase rule: Phase, component, degree of Freedom, phase rule definitions – one component system – water system.

UNIT –V: Chemical Equilibrium and Chemical Kinetics Reactions (11 Hours)

Chemical equilibrium: Criteria of homogeneous and heterogeneous equilibria,- decomposition of HI, N₂O₄, CaCO₃, PCl₅.

Chemical Kinetics: Order of reaction and their determinations-activation energy, effects of temperature on reaction rate.

Total Lecture Hours- 60

COURSE OUTCOME

1. Study the preparation of some drugs, and industrial chemistry.
2. Learn the concepts of resonance and halogen compounds are known.
3. Learn Aromatic compounds and organic reactions.
4. Understand the concepts of solid state chemistry.
5. Understand the principle of kinetics.

TEXT BOOK(S)

1. Biswas AK. 1989. Frontiers in Applied Chemistry, Narosa publishing house.
2. James A. Andley. 2018. Industrial chemistry, 9th edition, John Wiley Publishers, New Jersey.
3. James A. Kent. 2017. Riegel's handbook of Industrial Chemistry, 9th edition, S.Chand Publishers, Kochi, Kerala.
4. Nafis S. 2019. Organic Chemistry, 11th edition, S.Chand Publishers, Kochi, Kerala.
5. Thangamma Jacob and Macmillian, 1990. Textbook of Applied Chemistry, India Ltd. Mumbai.

REFERENCE BOOK(S)

1. Gerald H. Hollack. 2013. Fourth phase of water, Pearson Publishers, India.
2. Gopalan R. 2012. Text Book of Inorganic Chemistry, 2nd edition, Hyderabad, Universities Press, (India).
3. Morrison RT and RN and SK. Boyd Bhattacharjee SK. 2011. Organic Chemistry, 7th edition, Pearson India.
4. Puri BR, LR. Sharma LR and MS. Pathania MS. 2013. Principles of Physical Chemistry, 35th edition, New Delhi: Shoban Lal Nagin Chand and Co
5. Soni PL and HM.Chanurel. HM. 2012. A text book of Organic Chemistry, S.Chand Publishers, Kochi, Kerala.

E- RESOURCES

1. <https://www.springer.com/gp/book/9781461442592>
2. <https://mltcollege.org/wp-content/uploads/2020/05/Electron-displacement-effect.pdf>
3. <https://www.sciencedirect.com/book/9780080129488/aromatic-chemistry>
4. <https://www.freebookcentre.net/Electronics/Solid-State-Devices-Books.html>
5. <https://www.springer.com/gp/book/9783030171797>

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DEPARTMENT OF CHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: I-AP-I: Allied Chemistry Practical-I

Ins. Hrs./Week: 3

Course Credit: 2

Course Code: 21ACH102P

OBJECTIVES

- To determine the concentration of solution
- To learn the technique of titrimetric analysis.
- To describe the estimation of several cations and anions.

I. Acidimetry and alkalimetry

- (a) Strongacid VS Strongbase
- (b) Weakacid VS Strongbase
- (c) Determination of hardness of water.

II. Permanganometry

- (a) Estimation of ferrous sulphate
- (b) Estimation of oxalic acid

III. Iodometry

- (a) Estimation of potassium dichromate
- (b) Estimation of potassium permanganate

Scheme for Practical Evaluation.

Volumetric Estimation - 50 marks

Record -10 marks

Internal Assessment - 40marks

Volumetric Analysis: - 50 marks

Procedure -15 marks

Results

<2% -50marks

2-3% -40 marks

3-4% -30marks

>4% -20marks

COURSE OUTCOME

The students will be able to,

1. Evaluate the principle of redox chemistry in inter chealation reactions.
2. Learn the art of preparation of solutions of various molar concentrations.
3. Standardize various solutions.
4. Estimate the amount of substance present in a given solution.
5. Utilize the mathematical skills to use formulae and find solutions

TEXT BOOK(S)

1. Berry AJ. 2014. Volumetric Analysis (First edition), Cambridge University press, UK.
2. Gopalan R. 2000. Elements of analytical chemistry, S.Chand, New Delhi.
3. Lalitha Pottail and Subashini Sripathi. 2017. V Pubishing volumetric analysis and systematic analysis of organic compounds, First edition, Lap Lambert Academic Pubishing, USA.
4. Longman 1989. Vogel's Text Book of Quantitative Chemical Analysis, 5th edition, Engl.
5. Peter McPherson. 2014. Practical volumetric analysis, Royal Society of Chemistry.

REFERENCE BOOK(S)

1. Arthur I Vogel. 2010. Elementary practical organic chemistry (second edition), Pearson education.
2. Chirag R Fultariya DR, Jalap P Harsor DR, 2017, Volumetric analysis: concepts and experiments, First edition, Lulu.Com.
3. Frederick George Mann, Bernard Charles Saunders, Practical organic chemistry, Longman London and New York.
4. Gnanapragasam NS, Ramamurthy G. 1998. Organic Chemistry lab manual, S.Viswanathan and Co. Pvt. Ltd. Chennai.
5. Henry W Schimpf. 2009. A text book of volumetric analysis Bibliolife.
6. Venkateswaran V, Veerasamy R, Kulandaivelu AR. 2006. Basic principles of Physical Chemistry, Secondedition, Sultan Chand & Sons, New Delhi.

E-RESOURCES

1. <https://byjus.com/chemistry/volumetric-analysis/>
2. http://www.veerashaivacollege.org/images/pdf/study_material/volumetric_analysis.pdf
3. https://www.powershow.com/view0/86886c-zwmzn/volumetric_analysis_core_practical_chemistry_powerpoint_ppt_presentation
4. https://www.researchgate.net/publication/267029826_practical_volumetric_analysis
5. <https://chemistry.tcd.ie/assets/pdf/preliminary%20course/titration%20demonstration.pdf>

SEMESTER II

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: II-CC-II: Analytical Techniques

Ins. Hrs./Week: 6

Course Credit: 6

Course Code: 21BC203

OBJECTIVES

- To enable the students to have a deep knowledge on the techniques for measurement of biophysical factors in living organisms.
- To enable the students to get an insight on the usage of various techniques and their applications in industry and R&D.
- To develop competence in handling various chromatographic techniques and apply them in isolating and characterizing different biological molecules.

UNIT- I: Colorimetry (16 Hours)

Beer Lambert's Law, Light absorption and its transmittance, Absorption Spectroscopy - Principle, instrumentation and applications of colorimetry and UV-Vis spectrophotometer. Emission Spectroscopy – Spectrofluorimeter - Principle, instrumentation and applications. Flame photometry - principle and applications.

UNIT- II: Chromatographic Techniques (19 Hours)

Chromatography - Principle, method and applications of paper, thin layer, ion exchange, affinity chromatography, gel permeation chromatography and Gas liquid chromatography, Hydrophobic interaction chromatography, liquid chromatography, reverse phase chromatography, liquid chromatography, gel filtration chromatography, flash chromatography. Partition and adsorption chromatography.

UNIT- III: Centrifugation Techniques (19 Hours)

Cell disruption and homogenization-Media for homogenization, methods of cell disruption. Centrifugation - principle- sedimentation coefficient, RCF. Types of centrifuges and rotors. Preparative centrifugation differential, density gradient centrifugation, and Analytical ultracentrifugation – instrumentation and applications - Determination of molecular weight.

UNIT- IV: Electrophoretic techniques (19 Hours)

Electrophoresis - Principles and applications of electrophoresis, Factors affecting electrophoretic mobility. Types of electrophoretic techniques – zonal, capillary, paper and agarose gel. PAGE- Native - PAGE and SDS PAGE. Staining method used in electrophoretic technique, Isoelectric focusing. General scheme for purification of biocomponents.

UNIT- V: Radio isotopic techniques (17 Hours)

Types of radioactive decay, rate of radioactive decay, decay constant, Units of radio activity, measurement of radioactivity based on ionization- GM counter and excitation- Scintillation counter. Autoradiography. Applications of radioisotopes in biology. Hazards of radioactivity, CT scan, MRI scan, Doppler.

Total Lecture Hours- 90

COURSE OUTCOME

The students will be able to,

1. Acquire practical training to handle the instruments like colorimeter, spectrophotometer and to use them for biochemical determinations.
2. Acquire practical skill to separate proteins by gel filtration and PAGE, and are able to separate amino acids and sugar using the techniques of paper/thin layer chromatography, students.
3. Learn about the principle and applications of spectrophotometry, different chromatographic techniques like gel filtration, Ion exchange, thin layer, etc.
4. Students also learn about various electrophoretic techniques such as cellulose acetate, gel, PAGE, etc. and their applications in analyzing proteins and nucleic acids.
5. Learn the basic principles of centrifugation, various types of centrifuges, rotors and methods for subcellular fractionation

TEXT BOOK(S)

1. West, E.S. and Todd, W.R., MacMillan, Textbook of Biochemistry, 1985 Germany.
2. Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath, 2014 Biophysical Chemistry (Principles and Techniques) 4th Edition Himalaya Publishing House, India.
3. Keith Wilson & John Walker, 2005, Principles and Techniques of Practical Biochemistry Cambridge University Press, India.
4. Rajan Katoch. 2011. Analytical Techniques in Biochemistry and Molecular Biology, 1st edition, Springer New York Dordrecht Heidelberg London Publishers, United Kingdom.
5. Sabari and Srivastava A. K., 2009, Fundamentals of Bio Analytical Techniques and Instrumentation Ghosal PHI Learning Pvt. Ltd. India.

REFERENCE BOOK(S)

1. Abhilasha Shourie and Shilpa S Chapadgaonkar, 2015, Bioanalytical Techniques, The Energy and Resources Institute, TERI, India.
2. C.R. Kothari, 2004 Research Methodology, Methods and Techniques, 2nd ed, New Age International Publishers. India.
3. Braun, R.P, 1987, Introduction to Instrumental Analysis, Tata McGraw Hill, India.
4. Pavia et al, 2000, Introduction to Spectroscopy. 3rd Edition, Brooks/Cole Pub Co., New Delhi, India.
5. Machve, K. and Neha, K. 2010, Basic Instrumentation, Publishers & Distributors, India.

E-RESOURCES

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2. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2020-%204.pdf>
3. <https://nptel.ac.in/content/storage2/courses/102103047/PDF/mod3.pdf>
4. <https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf>
5. <https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod2.pdf>

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)



SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2021 – 2022)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: II-CP-II: Analytical Techniques Practical

Ins. Hrs./Week: 3

Course Credit: 2

Course Code: 21BC204P

OBJECTIVES

- To make the students to learn separation techniques and handling of certain laboratory equipments

PRACTICALS

1. Preparation of Buffers and measurement of pH.
2. Titrable acidity of Aminoacids
3. Measurement of Blood pressure
4. Calculate Body Mass Index (BMI)
5. Handling of Colorimeter and Spectrophotometer
6. Estimation of RNA by Orcinol method.
7. Estimation of DNA by Diphenylamine method.

DEMONSTRATION

1. Paper Chromatography for separations and detections of simple Sugars and Aminoacids.
2. Separation of plant pigments by Column Chromatography.
3. Thin Layer Chromatography of Aminoacids.
4. ECG
5. EEG
6. Doppler
7. CT-SCAN
8. MRI-SCAN

COURSE OUTCOME

- Students acquire skill in handling some specified equipments and their application
- Able to separate amino acids and sugars using chromatographic techniques

TEXT BOOK(S)

1. David Plummer. 1988. A Textbook of Practical Biochemistry. Tata McGraw- Hill Education.
2. Peramachi Palanivelu. 2018. Analytical Biochemistry and Separation Techniques - A Laboratory Manual, 4th edition, Twenty first century Publishers, Srilanka.
3. Rajan Katoch. 2011. Analytical Techniques in Biochemistry and Molecular Biology, 1st edition, Springer New York Dordrecht Heidelberg London Publishers, United Kingdom.
4. Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath. 2014. Biophysical Chemistry (Principles and Techniques), 4th edition, Himalaya Publishers, Hyderabad.
5. Machve, K.K. 2015. Basic Instrumentation. 4th edition, Neha Publishers. India.

REFERENCE BOOK(S)

1. Methods in Enzymology Vol. I and II by S.P. Colowick and N.O. Kaplan eds. New York:

- Academia Press, 1955.
2. Jayaraman, J. 1981. Laboratory Manual in Biochemistry. New Age International Publishers. 2nd Edition.1981.
 3. Alan H Gowenlock, 1988. Varley's Practical Clinical Biochemistry, Sixth Edition, CBS Publishers and distributors, India.
 4. Kothari, C.R. 2004. Research Methodology, Methods and Techniques, 2nd edition, New Age International Publishers, India.
 5. Ghosal Sabari and Srivastava A, 2009. Fundamentals of Bio Analytical Techniques and Instrumentation, 2nd edition, PHI Learning Pvt. Ltd. India.

E-RESOURCES

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2. https://www.cdc.gov/bloodpressure/materials_for_patients.htm
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4890841/>
4. <https://www.healio.com/cardiology/learn-the-heart/ecg-review/ecg-interpretation-tutorial/introduction-to-the-ecg>
5. <https://imotions.com/blog/what-is-ecg/>

**SENGAMALA THAYAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2021 – 2022)

DEPARTMENT OF CHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: II-AC-II: Allied Chemistry- II

Ins. Hrs./Week: 4

Course Credit: 3

Course Code: 21ACH203

OBJECTIVES

- To learn the basics of nuclear chemistry.
- To understand the properties and applications of carbohydrates, amino acids and proteins.
- To study the basic concepts of polymers, heterocyclic compounds.

UNIT- I: Nuclear Chemistry (12 Hours)

Nuclear Chemistry: Fundamental particles of nucleus- isotopes, isobars, isotones and isomers—differences between chemical reactions and nuclear reactions, nuclear fusion and fission-radioactive series. Nuclear chain reactions-Breeder reaction-Nuclear power plant

UNIT- II: Carbohydrates, Amino acids and proteins (12 Hours)

Carbohydrates: classification – glucose and fructose – preparation and properties—structure of glucose Fischer and Haworth cyclic structures.

Amino acids and proteins: Amino acids – Classification based on structure. Essential and non – essentials amino acids – preparation, properties and uses – peptides (elementary treatment only) proteins – Classification based on physical properties and biological functions. Structure of proteins – primary and secondary (elementary treatment). Zwitterion. Isoelectric point.

UNIT- III: Hetero cyclic compounds, Vitamins and Drugs (12Hours)

Heterocyclic compounds: Furan, pyrrole and pyridine—preparation, properties and uses basic properties of pyridine and pyrrole. Vitamins: Biological activities and deficiency diseases of Vitamin A, B, C, D, E and K -Hormones- Functions of insulin and adrenaline. Drugs- Sulpha Drugs- Uses and Mode of action of Sulpha Drugs. Antibiotics- Uses of Penicillin, Chloramphenicol, streptomycin.

UNIT- IV: Surface and Photo Chemistry (12Hours)

Surface Chemistry: Introduction to surface chemistry absorption, adsorption physisorption- chemisorption –Difference between physisorption and chemisorption. Emulsions, gels – preparation, properties - Electrophoresis and applications. Photochemistry : Laws of photochemistry - Lambert and Beer's law, Grothus Drapper law and Stark Einstein law of photochemical equivalence its and applications.

UNIT –V: Chromatographic Techniques (12 Hours)

Introduction to Qualitative and Quantitative Analysis –Error Analysis- Mean, Median, Mode, Standard Deviation (Only Definition) Chromatographic

separations - Principles and application of column, paper, thin layer chromatography.

Total Lecture Hours- 60

COURSEOUTCOME

The students will be able to,

1. Know the applications of physical, inorganic and organic chemistry towards biological systems.
2. Recognize and predict the structure and reactivity of biologically important organic molecules
3. Understand the synthesis of biologically important organic molecules and their role in metabolic pathways
4. Understand the building blocks of both DNA and RNA, secondary structures, tertiary structures.
5. Understand hetero cyclic compounds and separation techniques

TEXT BOOK(S)

1. Brian Wardle. 2019. Principles and applications of photochemistry, 4th edition, John Publishers.
2. Jain JL. 2017. Elementary Bio-Chemistry, 2nd Revised edition, S. Chand & Company.
3. James M Miller. 2019. Chromatography contrast and concept, 5th edition, Wiley publishers.
4. Raj K Pansal. 2017. Heterocyclic compounds, 5th edition, New Age publishers.
5. Sathyanarayana U. 2019. Essentials of Bio-Chemistry, 3rd edition, Books & Allied Pvt. Ltd.

REFERENCE BOOK(S)

1. Bahl BS, and Bahl A. 2010, Organic Chemistry, 12th edition, Sultan Chand & Co, New Delhi.
2. Puri B.R, Sharma LR, Kalia KC. 2004-2005. Principles of Inorganic Chemistry, 21st edition, Vallabh Publications.
3. Puri BR, Sharma LR, Pathania MS. 2013. Principles of Physical Chemistry, (35th edition), Shoban Lal Nagin Chand and Co, New Delhi.
4. Vaithyanathan S and Others. 2019. Textbook of Ancillary Chemistry, 2nd Edition, Priya Publications, Karur.
5. Veeraiyan V. 2016. Textbook of Ancillary chemistry, Highmount Publishing house, 14th Edition, (Both in Tamil and English) Chennai.

E-RESOURCES

1. <https://www.springer.com/gp/book/9783030620172>
2. <https://www.kobo.com/us/en/ebook/carbohydrates-6>
3. <https://www.routledge.com/Chemistry-of-Heterocyclic-Compounds/Parashar/p/book/9781466517134>
4. <https://www.taylorfrancis.com/books/handbook-surface-colloid-chemistry-birdi/10.1201/b18633>
5. <https://onlinelibrary.wiley.com/doi/book/10.1002/9780471980582>
6. <https://www.springer.com/gp/book/9783030171797>

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF CHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: II-AP-II: Allied Chemistry Practical- II

Ins. Hrs./Week: 3

Course Credit: 2

Course Code: 21ACH204P

OBJECTIVES

- To introduce the fundamental methods and procedures used in the analysis of organic compounds at micro and semi-micro scale.
- To perform laboratory experiments to demonstrate the synthetic reactions
- To make them able to identify, classify, analyze organic molecules

Organic Qualitative Analysis

Analyze the following organic Compounds.

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Acid
6. Amine

The students may be trained to perform the specific reactions like tests for elements (nitrogen only), aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.

Scheme of Evaluation

Organic Qualitative Analysis	50 marks
Identification of Nitrogen	5marks
Saturated and unsaturated	5marks
Aliphatic or Aromatic	5 marks
Preliminary reactions with Procedure	15marks
Functional group identification Correctly	10marks
Confirmative test	10marks
Record	10 marks

COURSEOUTCOME

The students will be able to,

1. Learn practical knowledge in the synthesis of organic compounds on lab scale.
2. Understand the common organic reactions.
3. Analyze various organic compounds using documented procedures.
4. Classify organic compounds based on functional groups.
5. Distinguish the reactions of various functional groups.

TEXT BOOK(S)

1. Arthur I Vogel. 2010. Elementary practical organic chemistry second edition,

- Pearson education.
2. Chirag R Fultariya, DR. Jalap P Harsor. 2017. Volumetric analysis: concepts and experiments First edition, Lulu.
 3. Frederick George Mann, Bernard Charles Saunders. Practical organic chemistry, Longman London and New York.
 4. Gnanapragasam NS and Ramamurthy G. 1998. Organic Chemistry lab manual, S.Viswanathan and Co. Pvt. Ltd. Chennai.
 5. Henry W. Schimpf. 2009. A text book of volumetric analysis Bibliolife.
 6. Venkateswaran V, Veerasamy R, Kulandaivelu AR. 2006. Basic principles of Physical Chemistry, Second edition, Sultan Chand & Sons, New Delhi.

REFERENCE BOOK(S)

1. Ahluwalia, Sunita Dhingrs VK. 2000. Comprehensive practical organic chemistry University Press.
2. Gopalan R. 2000. Elements of analytical chemistry, S.Chand, New Delhi.
3. Satinder K Juneja, Aran Kumar. 2021. Practical Chemistry, S.Vinesh & Co
4. Vagish CB. 2018. Organic analysis, Kindle Edition.
5. Vogel's. 1989. Text book of practical organic chemistry, 5th edition, Prentic Hall.

E-RESOURCES

1. edu.rsc.org/resources/qualitative-tests-for-functional-group
2. wwwchem.uwimona.edu.jm/lab-manuals/c10expt25.html
3. pubs.acs.org/doi/10.1021/ac071150w
4. pubs.acs.org/doi/10.1021/acs.jchemed.0c00179.
5. www.itseyeris.com/book/comprehen
6. sive-practicalchemistry

SEMESTER III

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI-614016
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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: III-CC-III: Human Physiology

Ins.Hrs./Week: 6

Course Credit: 5

Course Code: 22BC305

UNIT-I: Body fluids (16 Hours)

Extra cellular fluid- Plasma Intracellular fluid: Lymph and Blood-composition and functions. Osmolarity of the body fluids, ionic composition, electrolytes, body buffers. Blood cells-Types, Morphology and functions, haemoglobin, haemopoiesis, blood coagulation and blood groups.

UNIT-II: Circulation and Respiration (15 Hours)

Circulation: Structure and functions of Heart and blood vessels. Origin and conduction of heart beat, cardiac cycles, cardiac factors controlling blood pressure, electro cardiogram.

Respiration: Anatomy and physiology of respiration, exchange of gases between lung and blood and between blood and tissues. Role of lungs in acid-base balance.

UNIT-III: Digestive system (16 Hours)

Anatomy of the digestive system, Salivary, Gastric, Biliary, pancreatic and intestinal Secretions- composition and functions. Movements in Gastro intestinal tract, Digestion and absorption in the small intestine. Absorption in the large intestine; Digestion and absorption of carbohydrates, lipids and proteins.

UNIT-IV: Excretory system and Muscle (14 Hours)

Excretory system: Structure and functions of kidney and Nephron, Urine- composition and formation. Renal regulation of acid-base balance. **Muscle:** Kinds of muscle, Ultrastructure and chemical composition of skeletal muscle, Sliding filament theory, Physicochemical changes during muscle contraction.

UNIT-V: Central nervous system (14 Hours)

Brief outline of nervous system-Brain, spinal cord, nerve fibre, synapse. Structure and types of neuron. Resting and action potential-conduction of nerve impulse. Synaptic transmission, neurotransmitters. Brain-chemical composition, metabolism, Biochemical aspects of learning and memory.

Total Lecture Hours- 75

COURSE OUTCOME

The students should be able to,

1. Explain and describe the composition, function of various body fluids like blood and lymph and their significance.
2. Define and explain the anatomy and physiology, various levels of organizations basic homeostatic mechanism.
3. Explain the morphology, physiology of skeletal system along with the physiology of Muscle contraction in co-ordination with the joints, their articulation and skin.
4. Classify the peripheral nervous system, nerves and morphology of special senses.
5. Understand the functions of important physiological systems of excretory system.

TEXT BOOK(S)

1. Jain AK. 2019. Textbook of Physiology with Free QA Physiology (2 Volume Set), 8th edition, Arya Medical (APC) Publishers, New Delhi.
2. Martini FH and Nath JL. 2009. Fundamentals of Anatomy & Physiology. 11th edition, Pearson Benjamin Cummings. USA.
3. Nitin Ashok John, 2019. CC Chatterjee's Human Physiology Volume – 1 & II, 13th edition, Kalyani Mukerjee Publications, Kolkata, India.
4. Pal GK. 2019. Comprehensive Textbook of Medical Physiology (2 Volume Set), 2nd edition, Jaypee Medical Publishers, India.
5. Sarda Subramaniam, Madhavan Kutty K and Singh HD. 2006. Text Book of Human Physiology. 6th edition, S.Chand and Company Publishers, New Delhi.

REFERENCE BOOK(S)

1. Guyton AC and Hall JE. 2006. Textbook of Medical Physiology. 11th edition. Saunders, Philadelphia. USA.
2. Shalya Subhash, 2000. Human Physiology: Systemic & Applied, 1st edition, CBS Publishers, New Delhi.
3. Silverthorn DU. 2016. Human Physiology: An Integrated Approach, 6th edition, Pearson Publishers, Austin.
4. Stuart H. Ralston, Ian D. Penman, Mark W. J. Strachan and Richard P. Hobson, 2018. Davidson's Principles and Practice of Medicine. 23rd edition, Elsevier Publishers, USA.
5. West ES, Todd WR, Mason HS and JTV. 2011. Textbook of Biochemistry, 4th edition, Bruggen Oxford IBH Publishers, New Delhi.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.pdfdrive.com/biochemistrystrayer-e25312085.html>
3. <https://www.pdfdrive.com/essentials-human-physiology-e1543905.html>
4. <https://www.pdfdrive.com/human-physiology-from-cells-to-systems-168189400.html>
5. <https://www.pdfdrive.com/human-anatomy-physiology-e51197.html>
6. <https://www.pdfdrive.com/essentials-of-medical-physiology-6th-edition-e32299678.html>

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: III-CP-III: Human Physiology Practical

Ins. Hrs./Week: 3

Course Credit: 2

Course Code: 22BC306P

1. Determination of bleeding time
2. Determination of clotting time
3. Estimation of haemoglobin content
4. Determination of heart rate and pulse rate
5. Determination of Blood group
6. Determination of Rh factor
7. Determination of erythrocyte sedimentation rate (ESR)
8. Recording of basal mass index
9. Enumeration of Red blood cells (RBC and WBC) – Demonstration
10. Demonstration on pulseoxymeter
11. Determination of blood pressure

COURSE OUTCOME

1. Students practically learn the histology of tissues & muscles and able to determine various parameters of blood.

TEXT BOOK(S)

1. Ghai CL. 2013. Textbook of Practical Physiology, 8th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
2. Inderbir Singh. 2011. Textbook of Human Histology, 6th edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
3. Kishore J. 2019. National Health Programs of India National Policies and Legislations Related to Health, 13th edition, Peepee Publishers, New Delhi.
4. Pal GK. 2019. Comprehensive Textbook of Medical Physiology (2 Volume Set), 2nd edition, Jaypee Medical Publishers, Chennai, Tamil Nadu.
5. Praful B Godkar, Bijal Dave & Laveena Muley. 2017. Textbook of Medical Microbiology and Parasitology, 1st edition, Bhalani Publisher, New Delhi.
6. Srinageswari K and Rajeev Sharma. 2018. Practical workbook of Human Physiology, 2nd edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.

REFERENCE BOOK(S)

1. Arthur C. Guyton. 2011. Guyton & Hall Textbook of Medical Physiology, 12th edition, Elsevier Health Science; 3rd edition Saunders, an imprint of Elsevier Inc., USA.
2. Chatterjees CC. 2020. Human Physiology (vol 1 and 2), 13th edition, CBS Publishing Distribution Pvt. Ltd., India.
3. Nitin Ashok John. 2019. CC Chatterjee's Human Physiology Volume – 1 & II, 13th edition, CBS Publishers, New Delhi.
4. Shalya Subhash. 2000. Human Physiology: Systemic & Applied, 1st edition, CBS Publishers, New Delhi.
5. West ES., WR. Todd, HS. Mason and JTV. 2011. Textbook of Biochemistry, 4th edition, Bruggen Oxford IBH Publishers, New Delhi.

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2. <http://ndl.iitkgp.ac.in/document/c25OeVJkSkdsa3cyUGpVN2xwU1RQQ3g1WWdHcStDZDNJRWxYNGQ0WUp2az0>
3. <https://ia801901.us.archive.org/26/items/KSembulingamEssentialsOfMedicalPhysiology6thEdition/K%20Sembulingam%20%20Essentials%20of%20Medical%20Physiology%2C%206th%20Edition.pdf>
4. <https://ia802205.us.archive.org/1/items/pdfy5vClyqSbVzIGpuT2/DM%20Vasudevan%20%20Textbook%20of%20Biochemistry%20For%20Medical%20Students,%206th%20Edition.pdf>
5. http://yengage.yenepoya.edu.in/idata/YenepoyaUniversity/ilFile/3/86/file_38672/001/CL%20Ghai%20%20A%20Textbook%20of%20Practical%20Physiology,%208th%20Edition.pdf
6. https://www.academia.edu/21912072/IB_Singh_Textbook_of_Human_Histology_6th_Edition
7. <https://bujhansi.ac.in/econtent/pages/shortcodes/biomedical/Guyton-and-Hall-Textbook-of-Medical-Physiology-12th-Ed.pdf>

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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: III-AC-III: Biology

Ins. Hrs./Week: 4

Course Credit: 3

Course Code: 22ABC301

UNIT-I: Inheritance Biology

(11 Hours)

Taxonomy, Types of taxonomy. Plants systematics: Taxonomy Vs Systematics. Principles and methods of taxonomy: concept of species of hierarchical taxa. Biological nomenclature (International code of Botanical nomenclature). Classical and quantitative methods of taxonomy. Classification of plants, animals and microorganisms.

UNIT-II: Taxonomy

(13 Hours)

Inheritance biology – Mendelian principle, Chromosome theory of inheritance, allele, multiple allele, poly gene inheritance, Linkage: Types, arrangement and theory. Crossing over: Mechanism, theory, sex linkage, sex limited and sex influenced characters, Mechanism of sex determination.

UNIT- III: Plant Physiology

(13 Hours)

Plant physiology- Photosynthesis, C₃, C₄ pathway, photo respiration. Plant pigment: Chlorophylls, Carotenoids. Plant hormone: Auxins, Gibberelins, Cytokinins, Ethylene, Traumatic acid, phytochemicals, Alkaloids, Flavonoids, Saponins, Quinines, Terpenes, Phenols, Nitrogenous compounds-functions.

UNIT- IV: Environmental Biology

(11 Hours)

Environmental Biology –Physical environment, biotic and abiotic, concept of habitat and niche, Resource partitioning: character displacement Concept, structure and functions of an ecosystem. Energy flow and mineral cycling in ecosystem. Terrestrial ecosystem and aquatic ecosystem.

Unit –V: Evolutionary Biology

(12 Hours)

Historical review of Evolutionary concept: concept of evolution, origin of life, theories of evolution. Evidences of evolution: Analogy and Homology, Embryological evidences. Paleontological evidences, molecular phylogeny. Population genetics: Hardy-Weinberg law, Types of natural selection.

Total Lecture Hours- 60

COURSE OUTCOME

The students will be able to,

1. Understand the Mendelian and molecular genetics, cell structure, cell physiology, and molecular processes of cells.
2. Understand organisomal form, function, and diversity.
3. Acquire knowledge on the principles and theory of evolution, and concepts of ecology.
4. Explain the processes of growth and development in individuals and populations.
5. Correlate the relationships between organisms and their environment.

TEXT BOOK(S)

1. Iralei and George Odian, 2006, General, organic and Biochemistry, 2nd edition, W.H. Freeman Company, New York.
2. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter, 2002, Molecular biology of the cell-4th ed.; Garland Science; New York.
3. Powar, C.B. 2010, Cell Biology, Himalaya publishing House, Hyderabad.
4. Sobti, R.C., Sharma, V.L. 2009, Essentials of Modern Biology, Ane Books, India.
5. Verma, P.S. and Agarwal, V.K. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S.Chand & Company Ltd, New Delhi,

REFERENCE BOOK(S)

1. Hans –Walter Heldt, 2010, Plant Biochemistry, 4th ed, Academic Press, Elsevier Publications, Netherland.
2. Pandey, S.N, Sinha, B.K. 2009, Plant physiology- 4th ed, Vikas Publishing House, New Delhi.
3. Verma, P.S. and Agarwal, V.K. 2012. Environmental Biology (Principles of Ecology) S.Chand & Company Ltd, New Delhi.
4. Sundara Rajan, S. 2008, Introductory Modern Biology, Anmol publications Pvt Ltd, New Delhi.
5. Verma, V. 2006. Text Book of Plant Physiology, Ane Books Pvt Ltd, New Delhi.

E-RESOURCES

1. <https://www.sciencelearn.org.nz/resources/2000-mendel-s-principles-of-inheritance>
2. <https://library.viu.ca/c.php?g=188912&p=1247781>
3. <https://www.khanacademy.org/science/ap-biology/natural-selection/natural-selection-ap/a/darwin-evolution-natural-selection>
4. <https://www.biologydiscussion.com/ecosystem/ecosystem-its-structure-and-functions-with-diagram/6666>
5. <https://www.intechopen.com/books/herbal-medicine/plants-secondary-metabolites-the-key-drivers-of-the-pharmacological-actions-of-medicinal-plants>

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: III-AP-III: Biology Practical

Ins. Hrs./Week: 3

Course Credit: 2

Course Code: 22ABC302P

1. To carryout gram staining for identifying bacteria.
2. To prepare squash mounts of onion root tips to study mitosis.
3. Separation of chloroplast pigments by Paper Chromatography.
4. Observation of various stages of chick embryo
5. Measurement of Physico - Chemical parameters in aquatic environment.
 - Dissolved Oxygen
 - Salinity
 - pH (Using pH paper (or) pH meter).
 - Free Carbon -di-oxide
 - Carbonates and Bicarbonates

COURSE OUTCOME

The students are able to,

1. Understand microscope, microcopy, and cytochemical techniques.
2. Acquire the knowledge of determining the water parameters using the laboratory equipment's and also learn the art of handling the equipment

TEXT BOOK(S)

1. Raven and Hetal, P. 2006, Biology 7th edition, Tata McGraw Hill Publications, New Delhi.
2. Powar, C.B. 2010. Cell Biology, Himalaya publishing House, and Hyderabad.
3. Sobti, R.C. and Sharma, V.L. 2009. Essentials of Modern Biology, Ane Books, India
4. Sundara Rajan, S. 2008. Introductory Modern Biology, Anmol publications Pvt Ltd, New Delhi.
5. Verma, V. 2006. Text Book of Plant Physiology, Ane Books Pvt Ltd, New Delhi.

REFERENCE BOOK(S)

1. Griffiths, A.J.F, 2008, Introduction to Genetic Analysis, 9th edition, W.H. Freeman & Co. Narway.
2. Ross, F.C.1986. Introductory Microbiology, Bell and Howell Co, London.
3. Taylor, R.G.W. 2005. Practical Cytology, Academic Press, London.

4. Verma, P.S. and Agarwal, V.K. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S.Chand & Company Ltd, New Delhi.
5. Pandey, S.N. and Sinha, B.K. 2009. Plant physiology- 4th ed, Vikas Publishing House, New Delhi.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <http://amrita.olabs.edu.in/?sub=79&brch=18&sim=237&cnt=1>
3. <https://www.khanacademy.org/science/ap-biology/heredity/meiosis-and-genetic-diversity/a/phases-of-meiosis>
4. <https://www.ysi.com/parameters/biochemical-oxygen-demand-bod>
5. <https://www.merckmillipore.com/IN/en/water-purification/learning-centers/applications/environment-water-analysis/cod/CLqb.qB.BIMAAFAZwsQWTdi.nav?ReferrerURL=https%3A%2F%2Fwww.google.com%2F&bd=1>

SEMESTER IV

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)**



SUNDARAKKOTTAL, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2021 – 2022)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: IV-CC-IV: Enzymes

Ins. Hrs./Week: 5

Course Credit: 4

Course Code: 22BC407

UNIT –I: History and Terminology (14 Hours)

Definition, history, classification, nomenclature, properties and functions of Enzymes. Coenzymes- Definition, classification, properties and functions. Metalloenzymes and metal activated enzymes. Units of enzyme activity. Turnover number. Non-Protein enzymes- Ribozymes. Abzymes.

UNIT –II: Isolation and Purification of Enzymes (18 Hours)

Isolation- localization and extraction of free and membrane bound enzymes. Purification of enzymes- Methods. Separation procedure based on molecular size, solubility difference and electric charge and selective adsorption. Fractionation of enzymes. Criteria of purity of enzymes.

UNIT –III: Enzyme kinetics (15 Hours)

Factors influencing enzymes activity. Derivation of Michaelis -Menten equation, Line weaver- Burke plots. Importance of Kcal/Km and Vmax. Enzyme inhibitors- reversible and irreversible inhibitors, Competitive, Noncompetitive and Uncompetitive. Feedback inhibition. Allosteric Enzymes and inhibition.

UNIT –IV: Mechanism of Enzyme action (14 Hours)

Active site: Definition and characteristics- Lock & Key model and Induced fit model. Enzymes catalysis: acid base catalysis, covalent catalysis, metal ion catalysis. Specificity of enzyme action Formation of Enzyme – Substrate complex. Bisubstrate reactions-brief introduction to sequential and Ping-Pong mechanisms with example. Mechanism of action of Chymotrypsin and Lysozyme.

UNIT –V: Immobilization of Enzymes (14 Hours)

Immobilization of enzymes. Principles and various methods of immobilization - Ionic bonding, adsorption, covalent bonding, microencapsulation and gel entrapment. Applications of immobilized enzymes. Applications of enzymes in Industry. Clinical importance of an enzyme.

Total Lecture Hours- 75

COURSE OUTCOME

The students should be able to,

1. Understand the classification and nomenclature of enzymes, specificity of enzyme Catalysis and regulatory enzymes.

2. Explain the mechanism of enzymes and the role of vitamins as coenzyme precursors.
3. Express the Michaelis - Menten equation and graphical representation of various inhibitors
4. Discuss the factors affecting enzyme activity and enzyme isolation & purification.
5. Describe the principles and methods of enzyme immobilization.

TEXT BOOK(S)

1. Price and Stevens 1989, Fundamentals of Enzymology, Oxford Bioscience publications 2ndEd, Newyork
2. Palmer T. and Bonner P. 2007. Enzymes: Biochemistry, Biotechnology, Clinical Chemistry, 2nd edition, Horwood Publishers, United Kingdom.
3. Weisman, Hand book of Enzyme technology, 3rd edition, Printice Hall Publishers, United Kingdom.
4. Satyanarayana, 2019. Fundamentals of Biochemistry, Allied & Books Pvt Ltd, Calcutta.
5. Jain. 2005. Fundamentals of biochemistry, 6th Edition, S.Chand Publishers, New Delhi.

REFERENCE BOOK(S)

1. Nelson, Michael M. Cox, 2004, Lehninger Principles of Biochemistry: International Edition, CBS Publishers, 4th Ed, London.
2. Stryer, 1995. Biochemistry: W.H. Freeman & Co., Scientific Research an Academic Publisher, New York.4th Ed.
3. Voet and JG.Voet. 1990. Biochemistry, 4th edition, John Wiley & SonsInc., Publishers, New York
4. White, 1959. Principles of Biochemistry, 3rd edition, McGraw Hill Book Co., Publishers, New York.
5. Priceand Stevens, 1999. Fundamentals of Enzymology, 3rd edition, Oxford University Press, New York.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2013-14.pdf>
3. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2015.pdf>
4. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2016-%2017.pdf>
5. https://www.rgpv.ac.in/campus/PY/enzymes_ppt.pdf

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester:IV-CP-IV:Enzymes Practical

Ins.Hrs./Week:3

Course Credit: 2

Course Code: 22BC40P

1. Isolation of enzymes from natural sources
2. Partial purification of an enzyme using bulk methods or Chromatography.
3. Determination of specific activity, pH and temperature of salivary amylase.
4. Determination of specific activity, pH and temperature of alkaline phosphatase
5. Determination of specific activity, pH and temperature of acid phosphatase
6. Determination of specific activity, pH and temperature of urease
7. Determination of K_M and V_{max} using Lineweaver-Burk plot for any one enzyme
8. Determination of activators for anyone enzyme
9. Determination of inhibitors for anyone enzyme.

COURSE OUTCOME

The students should be able to,

1. Understand the principles and procedures for isolation and evaluation of nucleic acids.
2. Analyze the equations of enzyme kinetics.
3. Understand the principles of enzyme inhibition.
4. Evaluate the mechanism of enzyme catalysis.
5. Determine the catalytic mechanism employed by the most well characterized enzymes

TEXT BOOK(S)

1. Price and Stevens 1989, Fundamentals of Enzymology, Oxford Bioscience publications 2nd Ed, New York.
2. U.Satyanarayana, 2019. Fundamentals of Biochemistry, Allied & Books Pvt Ltd, Calcutta.
3. J.L.Jain. 2005. Fundamentals of biochemistry, 6thEdition, S.Chand Publishers, New Delhi.
4. Voetand JG. Voet. 1990. Biochemistry, 4th edition, John Wiley & Sons Inc., Publishers, New York.
5. A.White, 1959. Principles of Biochemistry, 3rd edition, McGraw Hill Book Co., Publishers, New York.

REFERENCE BOOK(S)

1. Lehninger Principles of Biochemistry: D.L.Nelson, Michael M.Cox, International Edition, CBS Publishers, 4th Ed, 2004.
2. Stryer. W.H., 1995, Biochemistry Freeman &Co., Scientific Research an academic Publisher 4th Ed., New York
3. Marangoni, 2002, Enzyme kinetics. A modern approach, 1st edition, John Wiley Publishers, United Kingdom.
4. Dixon, and JF, Webb. 1979. Enzymes, 2nd edition, Longman Publishers, London.
5. Stryer I. 1988. Biochemistry, 2nd edition, W.H.Freeman & Co., Publishers, New York

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <http://amrita.olabs.edu.in/?sub=73&brch=8&sim=133&cnt=2>
3. <https://courses.lumenlearning.com/biolabs1/chapter/enzymes/>
4. <https://practicalbiology.org/bio-molecules/factors-affecting-enzyme-activity/investigating-the-effect-of-ph-on-amylase-activity>
5. <https://www.easybiologyclass.com/properties-of-enzymes-biochemistry-lecture-notes/>
6. <http://amrita.olabs.edu.in/?sub=73&brch=8&sim=133&cnt=2>
7. <https://courses.lumenlearning.com/biolabs1/chapter/enzymes/>
8. <https://practicalbiology.org/bio-molecules/factors-affecting-enzyme-activity/investigating-the-effect-of-ph-on-amylase-activity>
9. <https://www.easybiologyclass.com/properties-of-enzymes-biochemistry-lecture-notes/>

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: IV-AC-IV: Cell Biology

Ins. Hrs./Week: 3

Course Credit: 3

Course Code: 22ABC404P

UNIT -I: Basics of Cell Biology (12 Hours)

Discovery of Cell and Cell theory, Chemical Components of Cell. Structure of prokaryotic and eukaryotic cell and its differences, Comparison between plant and animal cell. General structure of cytoskeleton - structure, composition and functions of microfilaments, microtubules and intranuclear filaments.

UNIT -II: Cell Organelles (18 Hours)

Structure and functions of cell organelles: cell wall, nucleus, mitochondria, golgi bodies, lysosomes, endoplasmic reticulum (rough and smooth), microbodies, glyoxysome, peroxisome, vacuoles, plastids, chloroplast, chromatin, ribosomes, centrioles, chromosomes.

UNIT-III: Cell Membrane (15 Hours)

Chemical composition, structure, models, functions and specialization of plasma membrane. Lipid bilayer. Membrane pump (sodium – potassium Pump), solute transport by simple diffusion, facilitated diffusion and active transport (mechanism, types of active transport), osmosis. Electrical properties of membrane.

UNIT-IV: Cell Cycle, Cell Death and Cell Renewal (14 Hours)

Cell division, mitosis, meiosis, cytokinesis and their significant. Cell cycle: phases of cell cycle, Functional importance of each phase, Even during cell cycle. Checkpoints. Methods to study cell cycle - labelled mitotic curve, flow cytometry. Aging (senescence): symptoms, causes and theory. Cell death: Necrosis and apoptosis.

UNIT-V: Tools of Cell Biology (16 Hours)

Cell Fractionation techniques: Principle of centrifugation, Sedimentation Coefficient, Differential and Density Gradient centrifugation. Cell Visualization techniques: Principle of Light microscope and Electron microscope. Staining techniques – dye and fluorescent based techniques.

Total Lecture Hours- 75

COURSE OUTCOME

The students should be able to

1. Understand the cell theory and basic cell structure
2. Acquire knowledge on cell fractionation and cell visualization techniques
3. Illustrate the structure and function of various cell organelles in cell.
4. Describe the structure, function and composition of cell membrane.
5. Understand the mechanism of cell division and cell death

TEXT BOOK(S)

1. Cooper, G.M. and Hausman, RE. 2009. The Cell .A Molecular Approach. (5" ed) Sunderland
2. Krebs.JE, Kilpatrick. ST and Goldstein. ES, 2013, Lewin GENES XI, JONES & Bartlett Learning, Burlington, Massachusetts.
3. Lodish. HA, Berk. CA, Kaiser.M, Krieger. MP, Scott. A Bretscher H, Ploegh and Matsudaira, 2007, Molecular Cell Biology, 6th Edition, WH. Freeman Publishers, New York, USA.
4. PS Verma and VK Agarwal 2004 Cell Biology, Genetics, Molecular Biology Evolution and Ecology (14" ed), S.Chand and Company Ltd.
5. Watson. JD, TA. Basker and S. Bell, 2008, Molecular Biology of the Gene, 5th Edition. Dorling Kindersley Pvt., Ltd., New Delhi.

REFERENCE BOOK(S)

1. Bruce Alberts and Dennis Bray 2013, Essential Cell Biology. (4" ed). Garland Science, New York.
2. De Robertis, EDP, and De Robertis, EM.F. 2010, Cell and Molecular Biology (8thed). Lippincott Williams and Wilkins, Philadelphia.
3. Geoffrey M. Cooper and Robert. E. Hausman, 2009, The Cell: A Molecular Approach, Sinauer Associates, 5thEd, USA.
4. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiment (6th ed) John Wiley & Sons, Inc, United Kingdom.
5. Wayne M. Baker, 2008 The World of the Cell. (7th" ed). Pearson Benjamin Cummings Publishing, San Francisco.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://drive.google.com/file/d/1tghNWPyuqPiqKlrlllZzUrFwcoMiuoMa/>
3. [https://www.freebookcentre.net/biology-books-download/BASIS-ON-MOLECULAR-BIOLOGY-\(PDF-52P\).html](https://www.freebookcentre.net/biology-books-download/BASIS-ON-MOLECULAR-BIOLOGY-(PDF-52P).html).
4. [https://www.freebookcentre.net/biology-books-download/Basis-ofmolecular-cell-biology-\(PDF-36P\).html](https://www.freebookcentre.net/biology-books-download/Basis-ofmolecular-cell-biology-(PDF-36P).html).
5. <https://agrilif.org/gold/files/2012/09/Lecture-26.pdf>

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: IV-AP-IV: Cell Biology Practical

Ins.Hrs./Week:3

Course Credit: 2

Course Code: 22ABC404P

1. Study the components of a microscope
2. Cytochemical staining of proteins by Methyleneblue
3. Cytochemical staining of RNA by Methylgreenpyronin
4. Cytochemical staining of polysaccharides by PAS
5. Study on different stages of mitosis by temporary preparation in onion root tip
6. Study on different stages of meiosis by temporary preparation in onion flowerbuds / grass hopper testes
7. Study of cell organelles by using electron micrographs
8. Isolation of mitochondria from cabbage.
9. Separation of chloroplast pigments by paper chromatography.

COURSE OUTCOME

The students should be able to,

1. Gain the knowledge about handling of microscope.
2. Identify the microscopic examination of cell organelles.
3. Obtain hands on training in basic separation techniques in Cell biology.
4. Differentiate the stages of mitosis and meiosis.
5. Evaluate the cellular biomolecules by staining techniques.

TEXT BOOK(S)

1. Bruce Alberts and Dennis Bray. 2013, Essential Cell Biology.(4thed). Garland Science.
2. Cooper, G.M. and Hausman, R.E. 2009. The Cell. A Molecular Approach. (5th ed) Sunderland.
3. Ganesh M.K. and Shivashankara A.R. 2012. Laboratory Manual for Practical Biochemistry Jaypee publications, 2ndEd.
4. Lodish H.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.
5. Watson J.D, Basker T.A. and Bell S.P. 2008. Molecular Biology of the Gene, 5th Edition. Dorling Kindersley Pvt. Ltd., New Delhi.

REFERENCE BOOK(S)

1. Bruce Alberts, 2008, Molecular Biology of the cell: Garland Publishing, 5th Ed.
2. Cooper GM. and Hausman, RE. 2009. The Cell .A Molecular Approach. (5" ed) Sunderland
3. Geoffrey M. Cooper and Robert E. Hausman, 2009. The Cell: A Molecular Approach:, Sinauer Associates, 5thEd, USA
4. Lodish HA, Berk CA, Kaiser M, Krieger MP, Scott. A Bretscher. H, Ploegh and Matsudaira, 2007. Molecular Cell Biology, 6th Edition, WH. Freeman Publishers, New York, USA.
5. Watson. JD, TA.Basker and Sp.Bell, 2008, Molecular Biology of the Gene, 5th Edition. Dorling Kindersley Pvt., Ltd., New Delhi.

E-RESOURCES

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

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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: IV-SBE-I: Traditional Medicine

Ins. Hrs./Week: 2

Course Credit: 2

Course Code: 22SBEB1

UNIT-I: Introduction

(9 Hours)

Definition of Herbal drug, Importance of Herbal therapies, Herbal drugs verses Allopathic drugs, Safety in Herbal drugs and their interactions, General methods of extraction, isolation and purification of phyto-constituents.

UNIT-II: Phytoconstituents

(9 Hours)

Herbs used as nutraceuticals and healing agents; Isolation, identification and estimation of the following phytoconstituents with special emphasis to HPLC, HPTLC and other advanced techniques Aloin from *Aloes*, Vasicine from *Adhatoda vasica*, Andrographolides from *Andrographis paniculata*, Curcumin from *Curcuma longa*, Piperine from *Piper longum*.

UNIT-III: Applications of Herbal Medicine

(9 Hours)

Making and using herbal medicines for common ailments like cold, skin infections and Diarrhea; Analytical Profiles of selected herbs – *Brahmi*, *Anadrographis paniculata* *Aegle marmelos* and *Gymnema sylvestre*.

UNIT-IV: Quality Control of Herbal Medicines

(9 Hours)

Quality Control and Quality Assurance of Herbal ingredients as per W.H.O. Guidelines, Determination of tannins, Ash value, Extractable matter and Pesticide residues. Herbal product development Liquid orals, tablets, capsules, dermatologic and herbal cosmetics.

UNIT-V: Evaluation of Herbal Extracts & Herbal Drug Processing (9 Hours)

Qualitative and Quantitative estimation of active principles from standardized extracts by HPTLC, Biological standardization -Pharmacological screening of herbal extracts and Microbiological evaluation of herbal extracts, Toxicity studies on herbal extracts.

Total Lecture Hours 45

COURSE OUTCOME

The students should be able to,

1. Develop skills in practical work, experiments using laboratory equipment and collection, interpretation of herbal products and their utilization.
2. Make aware of the natural resources and environment and the importance of conserving the same.
3. Demonstrate and understand the importance of medicinal plants among different ethnic cultures through clear, logical writing.

4. Demonstrate as to how different cultures approach and use plants in different ways and how plants and people interact.
5. Understand the methods of estimation, screening techniques and Microbiological evaluation of herbal extracts.

TEXT BOOK(S)

1. Kokate CK and Purohit DP. Textbook of Pharmacognosy, Nirali Prakashan, Pune
2. Staba EJ. Plant Tissue Culture as a source of Bio-Medicinals
3. Trease GE. and Evans WE., Pharmacognosy Baillere Tindall, Eastbourne
4. Tyler VE, Brady LR and Robbers JE. Pharmacognosy Len & Febiger, Philadelphia
5. Wallis TE. Pharmacognosy, CBS Publisher, New Delhi

REFERENCE BOOK(S)

1. William C. Evans, 2009. Pharmacognosy. 16th edition. Saunders Limited, USA.
2. Indian Herbal Pharmacopeia, 2002. Indian Drug Manufacturers Association, India
3. Quality Control methods for medicinal plant material, 1998. WHO, Geneva
4. Pulak Km Mukherjee, 2019. Quality control of herbal drugs. 1st edition, Elsevier, USA.
5. Michael Meguffin, Christopher Hobbs, 1997. Botanical safety handbook. Herbal products association, USA.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.ncbi.nlm.nih.gov/books/NBK92773/>
3. <https://depts.washington.edu/pse406/notes.htm>
4. <https://www.intechopen.com/books/herbal-medicine/introductory-chapter-introduction-to-herbal-medicine>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6806606/>

SEMESTER V

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI- 6 14016
(For the Candidates admitted in the academic year 2021 -2022)

**DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY**

Ins. Hrs./Week: 6 **Semester: V-CC-V: Metabolism**
Course Credit: 5 **Course Code: 23BC509**

OBJECTIVES

- To make the students learn Bioenergetics with reference to as to how the living cells harness energy and channel it to biological work and to Metabolism, and as to how the cells extract and utilize energy through numerous enzyme-catalyzed reactions.
- To understand the major catabolic and anabolic pathways in metabolism of carbohydrates, lipids, amino acids and nucleotides.
- To make them key regulatory aspects in metabolic pathways

UNIT -1: Bioenergetics **(15 Hours)**

Energy transformation, Laws of thermodynamics; Biological oxidations/reductions and energy transducing membranes; Gibbs energy, free energy changes, redox potentials, phosphate, electrochemical and ion potentials, membrane structure, ion transport across membrane and membrane potentials, membrane transport mechanisms.

UNIT-II: Carbohydrate metabolism **(16 Hours)**

Glycolysis, citric acid cycle and their regulation; Order, organization and function of electron carriers in mitochondrial respiratory chain (electron transport), chemo-osmotic theory, oxidative and photosynthetic phosphorylation, pentose phosphate pathway and its regulation; Gluconeogenesis. Glycogenesis and glycogenolysis- Biosynthesis and regulation.

UNIT- III: Lipid metabolism **(15 Hours)**

Fatty acid biosynthesis: fatty acid synthase complex; α , β and γ oxidation of fatty acids; Biosynthesis of triacylglycerols, phosphoglycerides and sphingolipids; Biosynthetic pathways for Ketone bodies; Metabolism of chylomicrons, LDL, HDL and VLDL; Free fatty acids, Lipid levels in pathological conditions.

UNIT-IV: Amino acid metabolism **(15 Hours)**

Protein turnover, aminoacids pool. Biosynthesis of essential and non-essential amino acids. Degradation of essential and non-essential amino acids and their regulation. Transamination, oxidative deamination, ammonia intoxication, sources and fate of urea, Urea cycle and its regulation; In-born errors of amino acid metabolism.

UNIT-V: Nucleic acid metabolism **(14 Hours)**

De novo synthesis of purines and pyrimidines nucleotide and salvage pathway of purines nucleotide synthesis. Degradation of purines and pyrimidines nucleotide. Regulatory Control of biosynthesis and degradation of nucleotide; inhibitors of nucleic acid biosynthesis. Disorder of nucleicacids metabolism.

Total Lecture Hours- 75

COURSE OUTCOME

The students are able to,

1. Comprehend biochemistry of metabolism in living cells in relation to thermodynamic laws and principles.
2. Correlate as to how the living organisms exchange energy and matter with the surroundings for their survival, and store free energy in the form of energy-rich compounds
3. Recognize as to how the catabolic breakdown of the substances is associated with release of free energy; and the utilization of, free energy during synthesis of biomolecules i.e., anabolic pathways
4. Assess the crucial role of some hormones with regard to the integration of metabolic pathways.
5. Apply the knowledge of metabolic pathways to biotechnological and biochemical research.

TEXT BOOK(S)

1. Denise R Ferrier. 2013. Biochemistry (Lippincott's Illustrated Reviews), 6th edition, Lippincott Williams and Wilkins Publishers, Philadelphia.
2. Keith N Frayn and Rhys D. Evans. 2019. Human Metabolism A Regulatory Perspective, 4th edition, John Wiley Publishers, New Jersey.
3. Reginald H. Garrett, Charles M. Grisham. 2010. Biochemistry, 4th edition, Mary Finch Publishers, Massachusetts, United States.
4. Robert K. Murray, Darryl K. Granner, Peter A. Mayes, and Victor W. Rodwell. 2012. Harper's Illustrated Biochemistry, 29th edition, McGraw-Hill Medical Publishers, Canada.
5. Voet.D and Voet. J.G. 2010. Biochemistry, 4th edition, John Wiley & Sons Inc Publishers, New Jersey.

REFERENCE BOOK(S)

1. Berg JM, JL. Tymoczko, and L. Stryer W.H. 2012. Biochemistry, 7th edition, Freeman Publishers, New York.
2. David A Bender, Shauna M C Cunningham. 2021. Introduction to Nutrition and Metabolism, 6th edition, CRC Press Publishers, Florida.
3. David Nelson L and Michael Cox. 2021. Lehninger Principles of Biochemistry, 8th edition, W.H.Freeman & Co Ltd Publishers, New York.
4. Sareen S Gropper, Jack L Smith, & Timothy P Carr. 2018. Advanced Nutrition and Human Metabolism, 7th edition, Cengage Learning Publishers.
5. Victor Rodwell and David Bender. 2018. Harper's Illustrated Biochemistry, 31st edition Paperback - Illustrated, McGraw-Hill Education, New York.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. https://www.pnas.org/content/107/Supplement_2/8947
3. <https://pubmed.ncbi.nlm.nih.gov/23680095/>
4. <https://www.ncbi.nlm.nih.gov/books/NBK556047/>
5. <https://www.khanacademy.org/test-prep/mcat/biomolecules/fat-and-protein-metabolism/v/overview-of-fatty-acid-oxidation>

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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: V-CC-VI: Molecular Biology
Ins. Hrs./Week: 5 Course Credit: 5 Course Code: 23BC510

UNIT-I: Structure and Functions of Nucleic Acids (14 Hours)

The beginning of Molecular Biology; DNA: A carrier of genetic information, Chemical structure of DNA and Base composition, biologically important nucleotides, Watson-Crick model, Supercoiled DNA, structure of different types of nucleic acids, hydrolysis of nucleic acids. Conformation of nucleic acids: A, B, Z DNA, t-RNA, m-RNA.

UNIT-II: Replication of DNA (16 Hours)

Models of DNA Replication, Origin and direction of replication, discontinuous replication, DNA polymerases of prokaryotes and their mechanism of action; Primase, Ligase, Single strand DNA binding protein, Helicase, Topoisomerases Replication strategies for replicating circular DNA: Rolling circle replication and D-loop replication. Eukaryotic DNA polymerases, Strategies for replicating linear DNA, Inhibitors of replication.

UNIT-III: Transcription (16 Hours)

RNA synthesis and processing: Structure and function of RNA polymerases. Transcription in prokaryotes. Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA.

UNIT-IV: Translation (14 Hours)

Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proofreading, translational inhibitors, post- translational modification of proteins.

UNIT-V: Genetic Mutations and Gene Regulation (15 Hours)

Introduction and Types of Gene mutations - Base substitution, Frame shift mutation-insertion, deletion, missense, nonsense mutation. Mutagens-Physical and chemical. Reverse mutation in bacteria. DNA repair mechanism-Mismatch repair photoreactivation, excision and SOS repair. Beneficial and harmful effects of mutations. Regulation of Gene expression: Inducible operons - Lactose, Repressible operon - Tryptophan.

Total Lecture Hours- 75

COURSE OUTCOME

The students are able to,

1. Understand and apply the principles and techniques of molecular biology.
2. Learn the most significant discoveries and theories through the historical progress of biological scientific discoveries, and their impacts on the development of molecular biology.
3. Acquire knowledge on the principles and laws of inheritance at the cell, individual and population levels.
4. Understand the concepts such as gene structure and function, gene regulation, microbial genetics, mutation and DNA repair, PCR and sequencing, cancer genetics and evolution.
5. Learn as to how gene expression is regulated at different levels, and as to how tissue- specific expression is achieved and can be manipulated and studied experimentally.

TEXT BOOK(S)

1. Bruce Alberts, Alexander D. Johnson and Julian Lewis. 2014. Molecular Biology of the Cell, 6th edition, WW. Norton & Company Publishers, New York, USA.
2. Cooper GM. And RE. Hausman. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington Publishers, Augusta, Georgia.
3. Geoffrey Cooper and Robert E Harsman. 2004. The Cell-A Molecular Approach, 1st edition. ASM Press Publishers, Washington, United States.
4. James D. Watson, A. Baker Tania, P. Bell Stephen, Gann Alexander, Levine Michael and Losick Richard. 2017. Molecular Biology of the Gene, 7th edition, Pearson Education Publishers, New York, USA.
5. Rastogi SC. 2011. Cell and Molecular Biology, 3rd edition, New age International publisher, New Delhi, India.
6. David Freifelder. 2008. Molecular Biology, 2nd edition, Narosa publishing house Publishers, India.

REFERENCE BOOK(S)

1. Alberts B., Johnson A., Lewis J., Mofgan D., Raff M., Roberts Kand Walter P. 2014. Molecular Biology of the Cell. 6th edition. Garland Science, New York, USA.
2. Allison A. Lizabeth. 2012. Fundamental Molecular Biology, 2nd edition. J Willey and Sons, Hoboken, New Jersey.
3. Berg JM, Tymoczko JL, Gatto GJ and Stryer L. 2015. Biochemistry, 8th edition, WH Freeman & Co., New York, USA.
4. David Nelson L. and Michael Cox. 2021. Lehninger Principles of Biochemistry. 8th edition, WH. Freeman & Co Ltd Publishers, New York, USA.
5. Freifelder D and Malacinski GM. 2010. Essentials of Molecular Biology, 4th edition,

John and Bartlett Publishing, UK.

6. George M Malanciski. 2008. Freifelder's Essentials of Molecular Biology, 4th edition. Narosa Publishing House, India.
7. Gerald Karp. 2008. Cell and Molecular Biology, 5th edition, John Wiley and Sons Publishers, Hoboken, New Jersey.
8. Krebs JE., Kilpatrick ST. and Goldstein ES. 2013. Lewin' GENES XI, Jones & Bartlett Learning. Burlington, Massachusetts.
9. Lodish H., A. Berk, CA. Kaiser, M. Krieger, MP. Scott, A. Bretscher, H. Ploegh and P. Matsudaira. 2007. Molecular Cell Biology. 6th edition, WH. Freeman Publishers, New York, USA.
10. Watson JD, TA. Baker and SP. Bell. 2008. Molecular Biology of the Gene. 5th edition, Darling Kindersley (India) Pvt. Ltd., Publishers, New Delhi.

E-RESOURCES

1. <https://agriflife.org/gold/files/2012/09/Lecture-26.pdf>
2. https://static1.squarespace.com/static/6019d0bc7dff866728d961d3/t/601a68429c231608a9b8f2a0/1612343363359/biochemistry_satyanarayana_ebook_free.pdf
3. <https://drive.google.com/file/d/1tghNWPyuqPiqKIRl1ZzUrFwcoMiuoMa/>
4. [http://www.freebookcentre.net/biology-books-download/BASICS-ON-MOLECULAR-BIOLOGY-\(PDF-52P\).html](http://www.freebookcentre.net/biology-books-download/BASICS-ON-MOLECULAR-BIOLOGY-(PDF-52P).html)
5. [http://www.freebookcentre.net/biology-books-download/Basics-of-molecular-cell-biology-\(PDF-36P\).html](http://www.freebookcentre.net/biology-books-download/Basics-of-molecular-cell-biology-(PDF-36P).html)

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2021 – 2022)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY



Ins. Hrs./Week: 5

Semester: V- CC-VII Endocrinology

Course Credit: 5

Course Code: 23BC511

OBJECTIVES

- To learn about glands, organs, tissues and cells those synthesize and secrete hormones, hormone precursors and associated compounds
- To understand the roles of hormone receptors in hormone action including their location, types and signaling pathways
- To acquire knowledge on the roles of the endocrine system in maintaining homeostasis, integrating growth and development

UNIT-I: Hormones and Receptors

(14 Hours)

Hormones- Definition, Classification, Biosynthesis, Circulation and Degradation. Hormone receptors: Intracellular receptors - cytoplasmic and nuclear receptors. Cell surface receptors-ion channels, G-protein coupled receptors (GPCR), receptor kinases (tyr, ser/thr). Second messengers – cyclic nucleotides (cAMP, cGMP), lipids (phosphatidyl inositol diphosphate and DAG), calcium ions, Calmodulin and NO.

UNIT-II: Thyroid and Parathyroid hormones

(15 Hours)

Thyroid hormones- Biosynthesis, regulation, transport and biological actions. Hyperthyroidism and hypothyroidism. Antithyroid agents. Parathyroid hormone- Biosynthesis and biological actions. Hyperparathyroidism and hypoparathyroidism. Calcitonin and Calcitriol- Biosynthesis and biological actions. Paget's disease. Ricket's and osteomalacia.

UNIT-III: Hypothalamus and Pituitary hormones

(16 Hours)

Hypothalamic releasing factors. Anterior pituitary hormones- biological actions of Growth promoting and lactogenic hormones. Glycoprotein hormones-TSH and Gonadotrophins, the POMC family-ACTH, Endorphins and MSH. Posterior pituitary hormones- biological actions of vasopressin and oxytocin-. Pituitary diseases-Gigantism, Acromegaly, Dwarfism and Diabetes insipidus.

UNIT-IV: G.I. and Pancreatic hormones

(14 Hours)

Brief account of gastrointestinal hormones. Pancreatic hormones- Insulin- Biosynthesis, regulation and biological actions. Mechanism of action of insulin. Glucagon- Biosynthesis, regulation and biological actions. Somatostatin, pancreatic polypeptide and Insulin like growth factors.

UNIT V: Adrenal and Gonadal hormones

(16 Hours)

Adrenal hormones- Glucocorticoids, Mineralocorticoids- biosynthesis and biological effects. Catecholamines: biosynthesis and biological actions. Abnormal secretion of adrenal hormones-

Addison's disease. Cushing's syndrome, pheochromocytoma. Gonadal hormones-Androgens and estrogens-biosynthesis and biological actions. Ovarian cycle. Abnormal secretion of Gonadal hormones-Amenorrhea and gynacomastia.

Total Lecture Hours- 75

COURSE OUTCOME

The students are able to,

1. Acquire knowledge about classification, synthesis and circulation of hormones and types and mechanism of action of hormone receptors.
2. Illustrate the synthesis and biological actions of hormones from thyroid and parathyroid glands.
3. Acquire knowledge about pituitary and hypothalamic hormones.
4. Understand the role of the G.I and pancreatic endocrine cells in the regulation of blood glucose.
5. Identify the hormones released by the adrenal and gonadal origin, their biological actions and disorders.

TEXT BOOK(S)

1. Mac E. Hadley, Jon E. Levine, Jonathan Levine, 2009, Endocrinology, 6th edition. Benjamin Cummings Publishers, USA.
2. Nagini S. 2007. Text Book of Biochemistry, 2nd edition, Scitech publishers, India.
3. Norman Levin, 2019. Manual of Endocrinology and Metabolism, 5th edition, Wolters Kluwer Publishers, New York.
4. Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell. 2003. Harper's Illustrated Biochemistry, 26th edition, McGraw-Hill Medical Publishers, New York.
5. Smith EL, Hill RL, Robert LI. Lefkowitz RJ, Philip H, and Abraham W. 1983. Principles of Biochemistry: Mammalian Biochemistry, 7th edition, McGraw-Hill Education Publishers, New York.

REFERENCE BOOK(S)

1. Arthur C. Guyton and Hall, 2006. Text Book of Medical Physiology, 11th edition, Elsevier India pvt. Ltd., New Delhi.
2. Bernhard K and Winfried B. 2016. Hormones and the Endocrine System: A text Book of Endocrinology, 1st edition, Springer Nature Publishers, Switzerland.
3. De Robertis and De Robertis, 2001. Cell and Molecular Biology, 8th edition, Wolters Kluwer Publishers, India.
4. Lary Jameson J. 2017. Harrison's Endocrinology, 20th edition, McGraw Hill Publishers, New York.
5. Melmed S, Polonsky KS, Larsen PR, Kronenberg HM. 2016. Williams Textbook of Endocrinology, 13th edition, Elsevier Publishers, India.
6. Wilson and Foster, 1992. Textbook of Endocrinology, 8th edition. W. B. Saunders publishers, USA.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.pdfdrive.com/textbook-of-biochemistry-with-clinical-correlations-e184776201.html>
3. <https://www.news-medical.net/health/Pituitary-Gland-Hormones-and-Functions.aspx>
4. <https://www.pdfdrive.com/williams-textbook-of-endocrinology-expert-consult-e189818749.html>
5. <https://www.pdfdrive.com/harrison-endocrinology-e34584578.html>
6. <https://www.pdfdrive.com/endocrinology-basic-and-clinical-principles-e33437813.html>

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)**



SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2021 -2022)

DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: V-CP-V: Metabolism and Molecular Biology Practical

Ins. Hrs./Week: 3 Course Credit: 3 Course Code: 23BC512P

1. Estimation of carbohydrate by anthrone method.
2. Estimation of protein by Lowry method.
3. Estimation of lipid by the sulfo-phospho vanillin method.
4. Estimation of Iron by dipydril method
5. Estimation of calcium by Clark and Collip Method
6. Estimation of Nitrogen by Nessler's Method
7. Estimation of Phosphorous by Fiske and Subarrow method.
8. Extraction and quantification of DNA from animal source
9. Extraction and quantification of RNA from animal source

Demonstration

1. SDS-PAGE.
2. Agarose Gel Electrophoresis

COURSE OUTCOME

The students are able to,

1. Understand the concepts of metabolism, characteristics of metabolic pathways and strategies used to study these pathways.
2. Gain a detailed knowledge of various catabolic and anabolic pathways
3. Understand the regulation of various pathways
4. Gain knowledge about the diseases caused by defects in metabolism with emphasis on the metabolic control
5. Understand the basics of Molecular techniques

TEXT BOOK(S)

1. Kusum Gupta. 2003. Food and Nutrition Facts and Figures, 5th edition Jaypee brothers Medical publications (P) Ltd Publishers.
2. Shubhangi Joshi. 2002. Nutrition and Dietetics, 2nd edition, Tata McGraw - Hill Limited Publishers.
3. Swaminathan M. 2004. Handbook of Food and Nutrition. 2nd edition, The Bangalore printing and publishing Co.Ltd. (Bangalore press) Publishers.

REFERENCE BOOK(S)

1. Lehninger's Principles of Biochemistry (2019), Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN13: 978-1429234146 ISBN-10: 9781429234146
2. Textbook of Biochemistry with Clinical Correlations, 7th Edition. Textbook of Biochemistry, 7th Edition. Thomas M. Devlin (Editor). ISBN: 978-0-470-28173-4

3. Biochemistry (2013) 4th ed., Voet, Donald, Voet, Judith & Pratt, Charlotte. Wiley & Sons, Inc. (New Jersey), ISBN:978-1-11809
4. An Introduction to Molecular Biotechnology: Molecular Fundamentals, Methods and Applications in 2 Modern Biotechnology - M. Wink. Wiley, ed. 2, 2011.
5. Molecular and cellular Biology, Stephen L. Wolfe, Wadsworth Publishing Company, 1993
6. Molecular Biology LabFax, T.A. Brown (Ed.), Bios Scientific Publishers Ltd., Oxford, 1991
7. Electrophoresis in Practice: A Guide to Methods and Applications of DNA and Protein Separations, Fourth Edition; Dr. Reiner Westermeier, 2004.

E-RESOURCES

1. <https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors>
2. <http://rajswashya.nic.in/RHSDP%20Training%20Modules/Lab.%20Tech/Biochemistry/>
3. <Dr.%20Jagarti%20Jha/Techniques%20In%20Biochemistry%20Lab.pdf>
4. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistry-pdf.pdf?sequence=1&isAllowed=y
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**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)**



SUNDARAKKOTTAI, MANNARGUDI- 614 016
(For the Candidates admitted in the academic year 2021 -2022)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: V-MBE - I: Microbial Biochemistry

Ins. Hrs./Week: 5

Course Credit: 4

Course Code: 23MBEBC1

OBJECTIVES

- To make the students to understand the growth, enzymology and physiological processes of microbes
- To make the students to learn about the structure, classification, morphology, pathological importance of viruses and viral diseases.
- To impart the knowledge on important human diseases with respect to their causative agent, clinical symptoms, pathogenesis, mode of transmission, prevention and treatment.

UNIT-I: Introduction to Microbiology (13 Hours)

Scope and history of Microbiology. A brief introduction to major group of microorganisms- Bacteria, viruses, fungi, Protozoa, algae. Ultra structure of bacteria, Chemical composition of cell wall, Types of microscopy. Staining techniques-simple, differential and special staining techniques and negative staining-principle and procedure.

UNIT-II: Microbial Growth and Nutrition (16 Hours)

Nutritional types of microorganisms, nutritional requirements. Principles of microbial nutrition-chemoautotrophs, chemo-heterotrophs, photoautotrophs and photo-heterotrophs. Factors influencing the growth of microorganisms – temperature, pH, Osmotic pressure, moisture, radiations and different chemicals, Physiology of growth – Significance of various phases of growth.

UNIT-III: Pathogenic and Beneficial Microbes (16 Hours)

A brief account of medically important bacteria. Retroviruses, Viroids, Prions and emerging viruses such as HIV, Avian and swine flu viruses. Medically important fungi and protozoans. Beneficial applications of microbes:, Industrially important microbes. Gut microbiota and diseases, approaches for engineering gut microbiota, therapeutic uses of gut microbiota, Bacteriophages in control of bacteria.

UNIT-IV: Medical Microbiology (15 Hours)

Causative agent, clinical symptoms, pathogenesis, mode of transmission, prevention and treatment of the following viral diseases (a) Respiratory diseases: common cold, influenza, measles. (b) Neurological diseases: Dengue, Rabies (c) Liver diseases: Viral hepatitis. Immunodeficiency disease: - AIDS.

UNIT-V: Microbial Production of Enzymes and Antimicrobials (15 Hours)

Microbial production of penicillin and Tetracycline. Microbial production and commercial applications of Amylases, Proteases, Lipases. Antimicrobials- Control of Microorganism by physical and chemical agents. Mode of action of Antimicrobial agents, Antibiotic resistance mechanisms.

Total Lecture Hours- 75

COURSE OUTCOME

The students are able to,

1. Understand the scope and relevance of Microbiology as a scientific discipline
2. Analyze the nutritional requirements of microorganisms and their uptake.
3. Elucidate the growth and growth factors of microorganisms.
4. Gain knowledge about microbial metabolic diversity. The interdisciplinary approach helps to apply the acquired knowledge in various fields.
5. Acquire knowledge on basics in microscopy, culture methods and staining techniques.

TEXT BOOK(S)

1. Chakroborty P. 2003. A Text book of Microbiology, 2nd edition, New Central Book Agency (P) Ltd Publishers, New Delhi.
2. Kanika Sharma. 2011. Textbook of Microbiology – Tools and Techniques. 1st edition, Ane Books Pvt. Ltd Publishers, New Delhi.
3. Madigan MT. and JM Martinko. 2006. Brock's Biology of Microorganisms, 11th edition, Pearson Education Inc Publishers, London.
4. Rajan S. 2007. Medical Microbiology, 1st edition, MJP Publishers, Chennai.
5. Rajan S. 2007. Parasitology, 1st edition, SRS Publications, Chennai.

REFERENCE BOOK(S)

1. Alan J Cann. 2015. Principles of Molecular Virology. 6th edition, Academic press, California.
2. Ann Giudici Fettner. 1990. The science of viruses. 2nd edition, Quill, William Marrow, New York.
3. Ananthanarayanan, R. and Jeyaram Paniker, C.K. 2013. Textbook of Microbiology. 9th edition, University Press, Oxford, England.
4. Black, J.G. 2013. Microbiology: Principles and Explorations, 6th edition, John Wiley and Sons, Inc Publishers, Hoboken, New Jersey.
5. David Greenwood, Mike Barer, Richard Slack and Will Irving. 2012. Medical Microbiology. A Guide to Microbial Infections: Pathogenesis, immunity, Laboratory investigation and Control, 18th edition, Churchill Livingstone, London.

E-RESOURCES

1. <http://drs.cift.res.in/bitstream/handle/123456789/4559/Staining%20methods.pdf?sequence=1&isAllowed=y>
2. https://www.slideshare.net/shiningpearl18/haematoxylin-and-its-typesppt?next_slideshow=1
3. http://www.freebookcentre.net/medical_books_download/Medical-Microbiology.html

4. http://www.freebookcentre.net/medical_books_download/Medical-Microbiology-for-Graduate-Students.html
5. https://www.freebookcentre.net/medical_books_download/Microbiology-by-Angela-Echeverri.html
6. https://www.freebookcentre.net/medical_books_download/The-History-and-Scope-of-Microbiology.html

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: V-SBE-II: Phytotherapeutics

Ins. Hrs./Week: 2

Course Credit: 2

Course Code: 23SBEB2

OBJECTIVES

- To make aware of natural resources and environment and the importance of conserving the same.
- To know the exhaustive list of plants having active constituents effective against advanced diseases.
- To understand the phytochemistry of the drugs and the phytopharmacology of the drugs.

UNIT –I : Introduction to Phytotherapeutics (06 Hours)

Definition, history, scope and applications of phytotherapy. Phytotherapeutic agents and their role in treating diseases.

UNIT –II : Herbal Drugs and Allergens (06 Hours)

Classification of medicinal plants based on their effects – Ecological status with special reference to India, common herbal drugs available in market and their composition, Drug industries in India

UNIT- III : Herbal Drugs and their mechanism of action (06 Hours)

Herbal drugs acting on brain and nervous system – Rheumatic arthritis – Psychoactive drugs – Depressants, Stimulants, hallucinogens – sources, effects, basic mechanism of action.

UNIT- IV: Cardio vascular diseases and pulmonary disorders drugs (06 Hours)

Herbal drugs and Cardiovascular diseases – blood pressure – cardiac drugs of plant origins – alkaloids, anticoagulants – basic mechanism of action. Pulmonary / respiratory disorders – asthma – bronchitis – common cold – allergy – Remedy from plants.

UNIT- V: Herbal drugs in treating Urogenital disorders (06 Hours)

Drugs for urogenital disorders – roots of *Withania somnifera*– Memory stimulants – *Centella asiatica*– Drugs for dissolving kidney stones – *Musa paradisiaca* (pseudostem) – Antiinflammatory drugs – *Cardiospermum* – Anticancer drugs – *Catharanthus roseus*.

Total Lecture Hours- 30

COURSE OUTCOME

The students are able to,

1. Develop the ability to understand the plants as the source of medicines, the ecology of medicinal plants and the plant based drugs available in the market.
2. Acquire knowledge on the application of herbal drugs to cure various ailments
3. Learn major human ailments and the cure using herbal drugs as therapeutic agents
4. Isolate, identify and determine both quantitatively and qualitatively the active principles

present in plant parts

5. Understand the significance of ayurveda and in herbal medicine, and also the. Pharmacovigilance in herbal therapy and establish authentic standard.

TEXT BOOK(S)

1. Heinrich Michael. 2018. Fundamentals of Pharmacognosy and Phytotherapy, 3rd edition, Elsevier Health Sciences Publishers.
2. Jain Usman and Jadhav Tanvir. 2020. A Textbook of Phytochemistry, 2nd edition, S.Vikas and Compnay Publishers.
3. Kerry Bone and Simon Mills. 2013. Principles and Practice of Phytotherapy. 2nd Edition, Edinburgh New York : Churchill Livingstone Publishers.
4. Kokate CK. 2006. Pharmacognosy, 31st Edition, Nirali Prakashan Publishers.
5. Singh MP and Panda H. 2005. Medicinal Herbs with their formulations, 4th Rev. Edition, Daya Publishers.

REFERENCE BOOKS

1. Khan IA and Khanum A. 2004. Role of Biotechnology in medicinal & aromatic plants, Vol 1 and Vol 10, Ukkaz Publishers.
2. Purohit SS. 2005. Agricultural Biotechnology, 2nd edition. Dr. Updesh Purohit Publishers.
3. Slater A, Scott NW and Fowler MR. 2004. Plant Biotechnology – The genetic manipulation of plants, 2nd edition. Oxford University Press Publishers.
4. Francesco Capasso. 2003. Phytotherapy. A quick reference to herbal medicine. Springer Publishers.
5. Iqbal Ramzan. 2015. Phytotherapies, Efficacy, safety and Regulation, 1st edition. John Wiley Publishers.

E-RESOURCES

1. <https://www.slideshare.net/MarwaFayed1/phytotherapy-1-2020-184509192>
2. <https://www.intechopen.com/books/herbal-medicine/introductory-chapter-introduction-to-herbal-medicine>
3. https://publications.iarc.fr/_publications/media/download/2627/243766665abccd12254fd3ab98a0e47ab582f6c.pdf
4. <https://www.slideshare.net/mrmmodaq/herbal-medicine-43566287>
5. <https://www.intechopen.com/books/herbal-medicine/introductory-chapter-introduction-to-herbal-medicine>

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI - 614 016
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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: V-SBE-III: Herbal Cosmetics

Ins. Hrs./Week: 2

Course Credit: 2

Course Code: 23SBEB3

OBJECTIVES

- To learn the history of herbal medicines and dietary supplements
- To understand the herbal drugs that could potentially be used in the cosmetic technology to produce various types of cosmetics
- To assess a product on the basis of standardization of an extract, adequate labeling, and intended use, preparation of hair and skin care products

UNIT –I: Standardization of Herbal Material (06 Hours)

Quality Control and Standardization of Herbal Medicines, Need for standardization, Assessment of quality – Stability, Safety, toxicity and efficacy. Standardization of Crude plant material, Plant preparations and finished product. Steps Involved in Standardization – Pharmacognostic evaluation, Physico-chemical parameters, Chemical parameters, Chromatographic and spectroscopic analysis, Microbiological parameters.

UNIT –II: Cosmetic Technology-I (06 Hours)

Raw materials used for formulation of skin care and hair care cosmetics: source and description of raw materials of natural origin like fixed oils, waxes, gums, hydrophilic colloids, colours, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents used in the cosmetic formulations.

UNIT –III: Cosmetic Technology-II (06 Hours)

Stability aspects of cosmetics: Shelf-life, effects of environmental factors like light, temperatures etc., on product stability. Quality control tests of different cosmetic products, Packaging of cosmetics. Herbs used as antioxidants, free-radical scavenger, antiseptic, antibacterial, antiwrinkle, anti-fungal.

UNIT –IV: Hair and Skin Care Products (06 Hours)

Hair Care Products: Hair structure, Shampoos, Conditioners, Setting lotion, Hair creams, Hair dyes. Herbal skin care cosmetics: Cleansing agents - apricot. Emollients - aloe, almond. Astringent – amla, Freshening agent - chandan, khus. Skin Pigmentation - saffron, ambi haldi

UNIT –V: Types of Cosmetics preparations (06 Hours)

Coloured Cosmetics: Introduction, lip colour, nail polish and face make-up eye make-up Solutions, Lotions, Suspensions, Ointments, Creams or emulsions, Gels, Sticks, Powders, Tablets and Aerosols. Dental products: Dentifrices, Oral rinses, Tooth powder, Tooth paste. Personal Hygiene Products: Shaving creams, after shave products.

Total Lecture Hours- 30

COURSE OUTCOME

The students are able to,

1. Impart knowledge on the assessment of quality, quality control and standardization of herbal drugs
2. Learn plant based raw materials their source and information, and the various constituents used in the cosmetic formulation
3. Understand the stability, standardization, shelf life and quality control of herbal based cosmetic preparations .
4. Gain knowledge on the formulation of skin and hair care cosmetic products
5. Acquire knowledge on various types of cosmetics. In a nutshell it motivates the students to become entrepreneurs.

TEXT BOOK(S)

1. Vimaladevi, M. 2019. Textbook of Herbal Cosmetics, CBS Publishers.
2. Eiri Board. 2015. Herbal Cosmetics & Beauty Products with Formulations, Engineers India Research Ins Publishers.
3. Eiri Board. 2013. Hand Book of Synthetic And Herbal Cosmetics, Engineers India Research Ins Publishers.
4. Chattopadhyay, PK. 2013. Herbal Cosmetics & Ayurvedic Medicines, 3rd Revised Edition, Niir Project Consultancy Services and Publishers.
5. Panda, H. 2005. The Complete Technology Book on Herbal Beauty Products with Formulations and Processes, Asia Pacific Business Press Inc Publishers.

REFERENCE BOOK(S)

1. Nora Robson. 2017. Skin care: For dry skin. Lotions, creams, soap and scrubs. Make your own natural, organic cosmetics: Health & Beauty. (Volume 1), Create Space Independent Publishers.
2. Lorraine McCormick. 2019. Natural Soap Making for Beginners: How to Make Soap from Scratch Using Essential Oils, Herbs, and Other Natural Additives (Natural Health Care), independently published.
3. Helen Markham. 2013. Dry Skin Care Solutions: 21 Completely Natural Remedies for Achieving Healthy and Radiant Skin (Completely Natural Skin Care Series) (Volume 1), Create Space Independent Publishing Platform.
4. Vesela Tabakova. 2017. How to Grow Long Hair with Herbs, Vitamins and Gentle Care: Natural Hair Care Recipes for Hair Growth and Health (Organic Beauty on a Budget), independently published.
5. Mandi Nyambi. 2019. Fresh Face: Simple routines for beautiful glowing skin, every day (Skin Care Book, Healthy Skin Care and Beauty Secrets Book), Yillustrated edition, Chronicle Books Publishers.

E-RESOURCES

1. <https://www.slideshare.net/rahimbrave/herbal-cosmetics-69811712>
2. <https://www.slideshare.net/ShresthaPandey1/herbal-cosmetics-for-hair-and-skin-care>
3. <https://www.slideshare.net/LavanyaSA/drlavanyasa-standardization-of-herbal-drugs>
4. <https://www.slideshare.net/zhaciil/technology-in-the-field-of-cosmetics>
5. https://www.slidemembers.com/en_US/view/PPT-Templates/natural-cosmetic-presentation-ppt-11822
6. http://www.iamj.in/posts/2017/images/upload/269_277.pdf.

SEMESTER VI

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)**



SUNDARAKKOTT AI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2021 - 2022)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: VI-CC-VIII: Immunology

Ins. Hrs./Week: 6

Course Credit: 6

Course Code: 23BC613

OBJECTIVES

- To study about the organs involved in the immune system and their biological functions
- To understand the immunity and its types, immune response and immunoglobulins
- To study about hypersensitivity reactions and the production polyclonal and mono clonal antibodies and their application

UNIT-I: Immune system

(20 Hours)

Lymphoid organ - Types- Primary Lymphoid organ - Thymus, Bone marrow, Bursa and Secondary Lymphoid organ- Spleen, Lymphnode, Lymphocytes- their origin and differentiation, Types- B Cell, T Cell and NK cells. Antigen presenting cells- macrophages, dendritic cells, langerhans cell. Mechanism of phagocytosis. Complement -characteristic features, activation- Classical pathway and Alternative pathway- biological functions.

UNIT-II: Immunity

(19 Hours)

Definition, Types - Innate immunity- classification- active and passive - mechanism of innate immunity and Acquired immunity- classification- active and passive- mechanism of acquired immunity. Humoral and cell mediated immunity. Immunity to infection against bacteria and virus. Cytokines- interleukins, Interferon-their role in immune response.

UNIT-III: Immunoglobulins

(18 Hours)

Immunoglobulin- Definition, structure, types based on light and heavy chain, biological functions, generation of diversity. Antigen- Types, hapten, immunogen, factors determining antigenicity. Antigen-antibody interactions- agglutination, neutralization, complement fixation, opsonization, bacteriolysis and precipitation.

UNIT-IV: Immunity to infection

(17 Hours)

Hypersensitivity reactions- Definition, types based on time duration & location and mechanism. Transplantation-Definition, types, graft acceptance, graft rejection- types- rejection mechanism and prevention, immune suppressive drugs. HLA-immune response genes, HLA molecules, Auto immune diseases- pathogenesis - treatment.

UNIT-V: Immunochemical techniques

(16 Hours)

Production and applications of polyclonal antibodies. Principle, Production, biological significances of monoclonal antibodies. The precipitation reaction- immunodiffusion, immunoelectrophoresis, immunofluorescence, complement fixation test- principle, types, mechanism and biological significances. Principle, technique and applications of RIA and ELISA.

Total Lecture Hours- 90

COURSE OUTCOME

The students are able to,

1. Learn the structure and properties of lymphoid organs and role of immune cells.
2. Understand various types of immunity, immune response and the importance of immunity
3. Acquire knowledge about immunoglobulins and antigen - antibody interactions
4. Understand the hypersensitivity reactions and organ transplantation and immune response
5. Learn the technique of production of polyclonal and monoclonal antibodies and their applications.

TEXT BOOK(S)

1. Anil K. Sharma. 2019. Immunology: An Introductory Textbook, 1st edition, Jenny Stanford Publishers, California.
2. Gupta SK. 2017. Essentials of Immunology, 2nd edition, ARYA Publishers, New Delhi.
3. Kenneth Murphy. 2017. Janeway's Immunobiology, 9th edition, W.W. Norton & Company Publishers, New York.
4. Mohanty SK. 2019. Essentials of Microbiology & Immunology, 1st edition, Paras Medical Publishers, New Delhi.
5. Robert R. Rich. 2020. Clinical Immunology- Principles And Practice, 5th edition, Elsevier Publishers, India.
6. Shyamasree Ghosh. 2020. Computational Immunology Basics, 1st edition, CRC Press Publishers, England.

REFERENCE BOOK(S)

1. Abul K. Abbas, Andrew H. Lichtman, and Shiv Pillai. 2020. Cellular and Molecular Immunology, 10th edition, Elsevier Publishers, India.
2. Ashim K. Chakravarty. 2016. Immunology and Immunotechnology, 1st edition, Oxford Publishers, England.
3. Jenni Punt, Sharon A Stranford, Patricia P Jones and Judith A Owen. 2019. Kuby Immunology, 8th edition, Macmillan Education Publishers, London.
4. Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Roitt. 2016. Roitt's Essential Immunology, 13th edition, Wiley-Blackwell Publishers, New Jersey.
5. Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne, Janis Kuby. 2002. Immunology, 5th edition, W.H. Freeman Publishers, New York.

E-RESOURCES

1. <https://www.nature.com/ni/video>
2. <https://www.cell.com/immunity/home>
3. https://www.wpunj.edu/sec/vsec/science_courses/bio/BIOimmuANIM.html
4. <https://www.youtube.com/watch?v=K09xzIQ8zsg>
5. https://nptel.ac.in/content/syllabus_pdf/102105083.pdf

**SENGAMALA THAYAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)**



SUNDARAKKOTT AI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2021 - 2022)
DEPARTMENT OF BIOCHEMISTRY
B.Sc., BIOCHEMISTRY

Semester: VI-CC-IX: Clinical Biochemistry

Ins. Hrs./Week: 6

Course Credit: 6

Course Code: 23BC614

OBJECTIVES

- To know the clinical aspects of various metabolic disorders
- To understand the significance of diagnostic Biochemistry
- To provide an advanced understanding of the biochemical mechanisms and pathophysiological processes responsible for common biochemical disorders.

UNIT- I: Basic concepts of Clinical Biochemistry (19 Hours)

A brief review of units and abbreviations used in expressing concentrations and standard solutions. Specimen collection and processing (Blood, Urine, Faeces). Anticoagulant preservatives for blood and urine. Transport of specimens. Blood coagulation - disturbances in blood clotting - haemophilia A and haemophilia B. Blood groups, haemoglobin in Anaemias, Sickle Cell Anemia, Thalassemia, Porphyrias and porphyrinurias. Blood banking.

UNIT -II: Hepatic Function Test (17 Hours)

Homeostasis, Disorders of fluids, electrolyte balance and gastrointestinal system, disorder involving change in hydrogen ion concentration. Liver function tests, Jaundice, Haemolytic, Hepatic and Obstructive Jaundice. Renal function tests, normal and abnormal constituents of urine.

UNIT- III: Disorders of carbohydrate metabolism (18 Hours)

Sugar level in normal blood, maintenance of blood sugar concentration - endocrine influence on Carbohydrate Metabolism, Hypoglycemia, Glycosuria, Renal Threshold Value, Diabetes Mellitus - classification, complications, glucose tolerance test (GTT), Diabetic Coma, Diabetic Ketoacidosis, Glycogen Storage Diseases, Fructosuria, Galactosemia.

UNIT- IV: Disorders of Protein, Aminoacid and Nucleicacid metabolism (19 Hours)

Plasma proteins, their origin, significance and variation in diseases. Nitrogen Balance, Proteinuria, Multiple Myeloma, Wilsons Disease. Phenylketonuria, Alkaptonuria, Tyrosinosis, Albinism, Hartnups disease. Fanconic Syndrome, Cystinuria, Gout.

UNIT -V: Disorders of lipid metabolism (17 Hours)

Lipid metabolism in liver and adipose tissue, plasma lipoproteins, cholesterol triglycerides and phospholipids in health and diseases, Fatty Liver, Atherosclerosis, Lipid Storage Diseases, Hypolipoproteinemia and Hyperlipoproteinemia.

Total Lecture Hours- 90

COURSE OUTCOME

The Students are able to,

1. Understand the difference between plasma, serum, normal and abnormal constituents in various body fluids, Blood clotting mechanism and anticoagulants.

2. Acquire knowledge on the nature and function of various enzymes, normal levels and elevated levels in various diseases.
3. Comprehend that blood is a universal fluid for carrying different minerals, nutrients, proteins etc to and from various tissues.
4. Learn that many diseases result from imbalance in certain enzymes and helps in diagnosis of liver, cardiac, gastrointestinal, kidney diseases.
5. Make the students knowledgeable and potential human resource with basic understanding on clinical biochemistry.

TEXT BOOK(S)

1. Bruce Alberts, Alexander D. Johnson and Julian Lewis. 2014. Molecular Biology of the Cell, 6th edition, WW. Norton & Company Publishers, New York, USA.
2. Carl Burtis A. Edward Ashwood R. and David Bruns E. 2012. Textbook of Clinical Chemistry and Molecular Diagnosis, 5th edition, Springer Publishers, New York.
3. Chatterjee MN. and Ranashinde. 2012. Text Book of Medical Biochemistry, 8th edition, Jaypee Brothers Medical Publisher, New York.
4. Devlin TM. 2011. Textbook of Biochemistry with Clinical Correlations. 7th edition, John Wiley & Sons Publishers, New York .
5. Graham Basten. 2011. Introduction to Clinical Biochemistry, Interpreting Blood Results. Book Boon. 2nd edition, Bookboon.

REFERENCE BOOK(S)

1. Dennis Kasper and Eugene Braunwald. 2005. Principles of Internal Medicine. Harrison's Vol I & 2, 16th edition, McGraw-Hill Publishers, New York.
2. Harold Varley. 2006. Practical Clinical Biochemistry. 6th edition. CBS Publishers.
3. Lippincott William & Wilkins. 2018. Clinical Chemistry, Principles, Techniques, Correlations with Access. 8th edition. Michael Bishop, Edward Fody, & Larry Schoeff Publishers, Philadelphia.
4. Tata Mc Graw Hill Companies. 2001. The Metabolic & Molecular Basis of inherited Diseases, Vol 1, 8th edition, Vallersty Publishers, Mumbai.
5. Thomas M Devlin. 2006. Textbook of Biochemistry with Clinical Correlation. 2nd edition, Wiley & Sons Publishers, New York.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.ht>
2. https://www.enpab.it/images/2018/EbookBiologia%20Clinica%2001_Clinical%20Biochemistry%20and%20Metabolic%20Medicine%20-%20Martin%20Andrew%20Crook.pdf
3. [http://www.student.oulu.fi/-taneliha/Harpers_Illustrated_Biochemistry_\(29thEdition\).pdf](http://www.student.oulu.fi/-taneliha/Harpers_Illustrated_Biochemistry_(29thEdition).pdf)
4. https://static1.squarespace.com/static/6019d0bc7dff866728d961d3/t/601a68429c231608a9b8f2a0/1612343363359/biochemistry_satyanarayana_ebook_free.pdf
5. <https://www.pdfdrive.com/biochemistry-books.html>

**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: VI-CP-VI: Clinical Biochemistry and Immunology Practical

Ins. Hrs./Week: 6

Course Credit: 5

Course Code: 23BC615P

1. Collection of Blood and Urine, Types of preservative and anticoagulants
2. Hemoglobin content, RBC, TC/DC count, PCV, and ESR
3. Qualitative tests of Urine: Abnormal constituents:
Sugar, Protein (Albumin), Ketone Bodies, Bile Pigments and Bile Salts.
4. Quantitative estimation in Blood
 - Glucose
 - Cholesterol
 - Calcium
 - Urea.
 - Iron
 - Bilirubin
 - Uric acid
 - Creatinine
5. Quantitative estimations in Urine
 - Glucose
 - Urea
 - Uric acid
 - Creatinine
6. Immunology
 - Haemagglutination – Blood grouping and Rh typing
 - Widal test - rapid slide test for typhoid
 - VDRL test - test for syphilis
 - Latex agglutination test for rheumatoid factor and Pregnancy
 - Skin Prick Test

COURSE OUTCOME

The students are able to,

1. Explain the clinical significance of the laboratory tests
2. Perform the hematology based analysis
3. Acquire knowledge in collection of blood and urine samples and preservation for laboratory analysis
4. Analyze the biochemical parameters in blood quantitatively
5. Analyze the biochemical parameters in urine quantitatively and qualitatively
6. Apply important techniques used for the study of immunological reaction.

TEXT BOOK(S)

1. Jayaraman J. 2011. Laboratory Manual in Biochemistry, 3rd Edition, New Age International Pvt Ltd Publishers, India.
2. Sadasivam S. Manickam A. 2009. Biochemical Methods, 3rd Edition, New age publishers, India.
3. Sawhney SK. Randhir Singh. 2005. Introductory Practical Biochemistry, 2nd Edition, Alpha Science International, Ltd., United Kingdom.
4. Plummer T. 2001. Practical Biochemistry, 3rd Edition, McGraw Hill Publishing Company, New York, USA.
5. Pattabiraman TN. 1998. Laboratory manual in Biochemistry, 4th Edition, All India publishers, New Delhi.
6. Robert R. Rich. 2020. Clinical Immunology- Principles and Practice, 5th Edition, Elsevier Publishers, India.

REFERENCE BOOK(S)

1. Alan H Gowenlock. 1998. Varley's Practical Clinical Biochemistry, 6th Edition, CBS Publishers, India.
2. Godkar B. 2020. Textbook of Medical Laboratory Technology Vol 1 & 2 Paperback, 3rd Edition, Bhalani Publisher, New Delhi.
3. Kanai L Mukerjee. 1996. Medical Lab Technology, Vol I & II, 1st Edition, Tata Mcgraw Hill Publishers, New York, USA.
4. Ranjna Chawla. 2014. Practical Clinical Biochemistry Methods and Interpretations (Paperback). 4th Edition, Jaypee Brothers Medical Publishers, Tamil Nadu.
5. Kanai L Mukerjee. 1996. Medical Lab Technology Vol I & II, 3rd Edition, Tata McGraw Hill Publishers, New Delhi.
6. Ashim K. Chakravarty. 2016. Immunology and Immunotechnology, 1st Edition, Oxford Publishers, England.

E-RESOURCES

1. <https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors>
2. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistry-pdf.pdf?sequence=1&isAllowed=y
3. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistry-pdf.pdf?sequence=1&isAllowed=y
4. <https://www.pdfdrive.com/medical-biochemistry-4th-edition-medial-biochemistry-e194558015.html>
5. <https://www.pdfdrive.com/clinical-biochemistry-e33663835.html>
6. <https://www.cell.com/immunity/home>

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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(For the Candidates admitted in the academic year 2021 - 2022)

DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: VI-MBE-II: Pharmaceutical Biochemistry

Ins. Hrs./Week: 5

Course Credit: 4

Course Code: 23MBEBC2

OBJECTIVES

- To provide a detailed study on the action of drugs on living systems.
- To understand the ADMET (Absorption, Distribution, Metabolism, Excretion and Toxicity) properties of drugs.
- To make the students aware of biochemical aspects of drug discovery, drug screening and medicinal technologies

UNIT-I: General Principles of Pharmacology (15 Hours)

History of Drugs, Nature and Sources of drugs, Classification of drugs, Dosage forms of the drugs, Subdivision of pharmacology, routes of drug administration, absorption and distribution of drugs, factors influencing drug absorption and elimination of drugs. Toxicity assessment: acute, sub chronic, chronic exposure, determination of ED50 and LD50 values.

UNIT- II: Drug- Receptor interactions (15 Hours)

Pharmacodynamics – Site of drug action – Mechanism of action of drug - Agonist and antagonist. Types of receptor – Ion channel coupled receptors, G-Protein coupled receptors, Kinase linked receptors and Intracellular receptors, Enzyme as receptors, Binding forces involved in drug receptor interaction, drug action not mediated by receptors.

UNIT- III: Drug metabolism (14 Hours)

Definition – First Pass Metabolism, Chemical Pathways of Drug Biotransformation - Phase I reactions (Oxidation, Reduction, Hydrolysis) - Phase II reactions (Conjugation). Drug metabolising enzymes – Microsomal and Non microsomal enzymes, Role of Cytochrome P₄₅₀ in drug metabolism, Physiological importance of xenobiotic metabolism

UNIT –IV: Chemotherapy (16 Hours)

Chemotherapy: Mode of action of antimicrobial drugs-antibacterial, antiviral and antifungal and antimalarial drugs. Mode of action of anticancer drugs- antimetabolites, antibiotics, alkylating agents and other agents.

UNIT –V: Drugs acting on various systems (15 Hours)

CNS-sedative- hypnotic, GI tract drugs for peptic ulcer, diarrhoea and constipation. Miscellaneous drugs - antiseptic, disinfectant, chelating agents. Adverse drug reactions – side effect, secondary effect, and toxicity - Drug Allergy. Biological effects of drug abuse and drug dependence, drug tolerance and intolerance

Total Lecture Hours- 75

COURSE OUTCOME

The students are able to,

1. Learn the history, source, nature and classification of drugs, drug administration and toxicity assessment
2. Understand the drug- receptor interactions, types of receptors and mechanism of action of drugs
3. Acquire knowledge on the chemical pathways of drug biotransformation and physiological importance of xenobiotic metabolism
4. Understand the mode of action of antimicrobial agents and anti cancer drugs
5. Illustrate the adverse drug reactions, drug abuse and dependency

TEXT BOOK(S)

1. Gordan Gibson, G. and Paul Skett. Nelson Thornes, 1999. Introduction to Drug Metabolism, 3rd edition, UK.
2. Haque SS and Randhawa SS. 2017. Pharmaceutical Biochemistry. 2nd edition, S.Vikas and Company
3. Harbans Lal, 2018. Essentials of Pharmaceutical Biochemistry. 2nd edition, CBS publishers and Distributors.
4. Jayashree Ghosh, 2010. A Textbook of Pharmaceutical Chemistry, 3rd edition, S.Chand & Company Ltd., New Delhi.
5. Kadam SS, Mahadik R. 1998. Text Book of Medicinal Chemistry, Vol. 15th edn. Nirali Prakashan Publishers.
6. Tripathi KD. 2010. Essentials of Medical Pharmacology, 7th edition, Jaypee Publishers.

REFERENCE BOOK(S)

1. Abdul wahab and Shahid Ullah khan, 2015. Handbook of Pharmaceutical Biochemistry for Health Professionals. LAP LAMBERT Academic Publishing.
2. Bertram Katzung, 2012. Clinical Pharmacology, 12th edition, Lange Publishers.
3. Donald Cairns, 2012. Essentials of Pharmaceutical Chemistry, 4th edition, Pharmaceutical Press.
4. Robert K. Murray, Daryl K. Granner, Peter A. Mayer and Victor W. Rodwell, Mc Graw Hill, New York, 2006. Harper's Biochemistry. 25th edition. *Tata Mcgraw Hill Publishing Company*.
5. Thomas L. Lemke, David A. Williams, Victoria F. Roche and S. William Zito, Foye's Wolters Kluwer, 2012. Foye's Principles of medicinal Medicinal Chemistry. 7th edition, Lippincott Williams & Wilkins publisher.
6. Vyas SP, Kohli DV. 2019. Pharmaceutical Biochemistry, 1st edition, CBS Publishers.

E- RESOURCES

1. <https://guides.lib.uiowa.edu/c.php?g=132196&p=863259>
2. <https://libguides.library.usyd.edu.au/c.php?g=508174&p=3476667>
3. <https://guides.library.usciences.edu/ChemistryBioChemPharmaceuticalChem>
4. <https://epgp.inflibnet.ac.in/>
5. <https://guides.lndlibrary.org/pharmacy/pharm-books>

NON MAJOR ELECTIVE (NME)

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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: III-NME-I: Health and Diseases

Ins. Hrs./Week: 2

Course Credit: 2

Course Code: 22NMEBC31

UNIT-I: Specimen collection and processing (08 Hours)

Specimen collection and processing of blood, urine and faeces. Anticoagulants and preservatives for blood and urine. A brief review of units and abbreviations used in expressing concentrations, standard solutions and clinical values. Electrolytes and acid base balance. Maintenance of acid base balance by respiratory and renal mechanism. Acidosis and alkalosis.

UNIT- II: Disorders of Carbohydrate Metabolism (10 Hours)

Overview of regulation of blood glucose, Glucose Tolerance Test (GTT)-normal values and interpretations, causes of abnormal GTT curve, sugar levels in blood, renal glucosuria, hyperglycaemic hormones, and Diabetes mellitus pathological alterations in diabetes mellitus, acute and chronic complications of diabetes mellitus, management of diabetes mellitus, oral hypoglycaemic agents, and hypoglycaemia.

UNIT-III: Disorders of Lipids and Proteins (08 Hours)

Plasma lipoproteins, General structure of Lipoproteins, lipoprotein metabolism and transport, lipoprotein disorders, cholesterol, triglycerides and phospholipids in health and diseases. Hyperlipidaemia, hyperlipoproteinemia, abeta lipoproteinemia.

UNIT-IV: Disorders of Liver, Kidney and Heart (10 Hours)

Functions of liver, kidney and heart. Jaundice, fatty liver. Diagnostic enzymes in different diseases-myocardial infarction, liver diseases, muscle diseases, bone diseases, cancers and GI tract diseases. Renal calculi, Cardiac arrest and management, causes, symptoms, pathophysiology and diagnosis of atherosclerosis.

UNIT-V: Oncology (09 Hours)

Cancer – definition, terminology-neoplasia, hyperplasia, hypertrophy, dysplasia, metaplasia, adenoma, sarcoma, epidemiology, etiologic factors, biochemistry of metastasis, prevention- primary, secondary and tertiary prevention, principles of cancer therapy, diagnosis and staging-TNM method,

Total Lecture Hours- 45

COURSE OUTCOME

The students should be able to,

1. Know about basic procedures during biological sample collections.

2. Illustrate various types of diseases associated with impaired carbohydrate metabolism
3. Understand the disorders of protein and lipid metabolism and the associated diseases
4. Gain knowledge on disorders of liver, kidney and heart
5. Acquire knowledge on oncology and epidemiology, prevention and treatment of cancer

TEXT BOOK(S)

1. Birn AE., Pillay Y & Holtz T. 2009. Textbook of international health: Global health in a dynamic world, 3rd edition, Oxford University Press Publishers, England.
2. Chakrabarty, Kaveri and Chakrabarty AS. 2019. Textbook of Nutrition in Health and Disease, 1st edition, Springer Publishers, New York, USA.
3. Chatterjea MN and Rana Shinde. 2007. Textbook of Medical Biochemistry, 7th edition, Jaypee Brothers Publishers, Chennai, Tamil Nadu.
4. Krishna Das KV. 2013. Clinical Medicine (A Textbook of Clinical Methods and Laboratory Investigations), 4th edition, Jaypee Brothers Medical publishers, Chennai, Tamil Nadu.
5. Seyed Mohammad Nabavi, Grazia D Onofrio and Seyed Fazel Nabavi. 2020. Nutrients and Nutraceuticals for Active & Healthy Ageing, 1st edition, Springer Publishers, New York, USA.

REFERENCE BOOK(S)

1. Carl A. Burtis, Edward. Ashwood and David E. Bruns. 2011. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5th edition, Saunders Publishers, United States.
2. Kaplan A, Jack KE, Opheim B, Toivola B and Lyon AW. 1995. Clinical Chemistry Interpretation and techniques, 4th edition, Williams and Wilkins Publishers, United States.
3. Simon Langley-Evans. 2015. Nutrition, health and disease: A lifespan approach, 2nd edition, John Wiley & Sons Publishers, New Jersey, United States.
4. Vibha Rani, Umesh and Yadav. 2018. Functional Food and Human Health, 1st edition, Springer Publishers, New York, USA.
5. William S. Hoffman. 1964. The Biochemistry of Clinical Medicine, 3rd edition, Year Book Medical Publishers, Chennai, Tamil Nadu.

E RESOURCES

1. https://www.researchgate.net/publication/327247966_Chapter_06_Carbohydrates-III_Regulation_of_Blood_Glucose_Diabetes_Mellitus
2. <https://www.slideshare.net/amitverma1612147/lipoprotein-disorders>
3. [http://www.student.oulu.fi/~taneliha/Harpers_Illustrated_Biochemistry\(29th_Edition\).pdf](http://www.student.oulu.fi/~taneliha/Harpers_Illustrated_Biochemistry(29th_Edition).pdf)
4. <https://www.slideshare.net/ImranIqbal7/metabolic-disorders-2019>
5. <https://www.slideshare.net/veerundh/veerendhar-nadh-38767743>
6. <https://www.pdfdrive.com/biochemistry-books.html>

SENGAMALA THAYAR EDUCATIONAL TRUST WOMEN'S COLLEGE

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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY



Semester: IV-NME-II: Health Education and Community Pharmacy

Ins. Hrs./Week: 2

Course Credit: 2

Course Code: 22NMEBC42

OBJECTIVES

- To make the students learn the diseases induced due to deficiency of proteins vitamins minerals and disorders leading to various diseases in human beings.
- To understand the communicable and Non communicable diseases.

Unit –I: Concept of health

(06 Hours)

Concept of health: Definition of physical health, mental health, social health, spiritual health determinants of health, indicator of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.

Unit –II: Nutrition and health

(06 Hours)

Nutrition and health: Classification of foods, requirements, diseases induced due to deficiency of Proteins – Kwashiorkor, Marasmus, Vitamins – Rickets, Anemia. Minerals – Osteoporosis, Renal calculi - treatment and prevention.

Unit-III: First aid

(06 Hours)

First aid: Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings. Environment and health: Source of water supply, water pollution, purification of water, health and air, noise, light-solid waste disposal.

Unit-IV: Communicable diseases

(06 Hours)

Communicable diseases: Causative agents, mode of transmission and prevention. Respiratory infections: chicken pox and tuberculosis. Intestinal infection – Hepatitis, Typhoid and food poisoning. Surface infection – Rabies and Leprosy. Sexually transmitted diseases- Syphilis and AIDS. Non-communicable diseases: causative agents, prevention, care and control.

Unit-V: Epidemiology

(06 Hours)

Epidemiology: Its scope, methods, uses, dynamics of disease transmission. Immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection procedures for feces, urine, sputum.

Total Lecture Hours- 30

COURSE OUTCOME

The students should be able to,

1. Discuss about basic procedures during biological sample collections.
2. Explain various types of diseases associated with impaired carbohydrate metabolism
3. Understand the disorders of protein and lipid metabolism. And the associated diseases
4. Gain knowledge on disorders of liver, kidney and heart
5. Acquire knowledge on oncology, and epidemiology, prevention and treatment of cancer

TEXT BOOK(S)

1. dynamic world, 3rd edition, Oxford University Press Publishers, England.
2. Chakrabarty, Kaveri and Chakrabarty AS. 2019. Textbook of Nutrition in Health and Disease, 1st edition, Springer Publishers, New York, USA.
3. Chatterjea MN and Rana Shinde. 2007. Textbook of Medical Biochemistry, 7th edition, Jaypee Brothers Publishers, Chennai, Tamil Nadu.
4. Krishna Das KV. 2013. Clinical Medicine (A Textbook of Clinical Methods and Laboratory Investigations), 4th edition, Jaypee Brothers Medical publishers, Chennai, Tamil Nadu.
5. Seyed Mohammad Nabavi, Grazia D'Onofrio and Seyed Fazel Nabavi. 2020. Nutrients and Nutraceuticals for Active & Healthy Ageing, 1st edition, Springer Publishers, New York, USA.

REFERENCE BOOK(S)

1. Carl A. Burtis, Edward. Ashwood and David E. Bruns. 2011. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5th edition, Saunders Publishers, United States.
2. Kaplan A, Jack KE, Opheim B, Toivola B and Lyon AW. 1995. Clinical Chemistry Interpretation and techniques, 4th edition, Williams and Wilkins Publishers, United States.
3. Simon Langley-Evans. 2015. Nutrition, health and disease: A lifespan approach, 2nd edition, John Wiley & Sons Publishers, New Jersey, United States.
4. Vibha Rani, Umesh and Yadav. 2018. Functional Food and Human Health, 1st edition, Springer Publishers, New York, USA.
5. William S. Hoffman. 1964. The Biochemistry of Clinical Medicine, 3rd edition, Year Book Medical Publishers, Chennai, Tamil Nadu.

E RESOURCES

1. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_stude
2. https://www.researchgate.net/publication/327247966_Chapter-06_Carbohydrates-III_Regulation_of_Blood_Glucose_Diabetes_Mellitus
3. <https://www.slideshare.net/amitverma1612147/lipoprotein-disorders>
4. [http://www.student.oulu.fi/~taneliha/Harpers_Illustrated_Biochemistry\(29th_Edition\).pdf](http://www.student.oulu.fi/~taneliha/Harpers_Illustrated_Biochemistry(29th_Edition).pdf)
5. <https://www.slideshare.net/ImranIqbal7/metabolic-disorders-2019>

VALUE ADDED COURSE



**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

VALUE ADDED COURSE

VAC II- Nutraceuticals

Total Ins. Hrs. : 30

Course Code : U23BCVA2

Objectives:

The main objectives of this course are to:

- To provide Basic knowledge about nutraceuticals
- To understand the health benefits of nutraceuticals
- To apply basic techniques for the production of nutraceuticals
- To give exposure to basic analytical instruments relevant to nutraceutical industries

UNIT-I

(5 Hours)

Theory: Introduction to nutraceuticals, Classification and sources of nutraceuticals. Dietary supplements, fortified foods and functional foods.

UNIT-II

(7 Hours)

Theory: Introduction to Phytonutraceutical. Classification - Plant secondary metabolites, Extraction and purification of Phytonutraceuticals.

UNIT-III

(7 Hours)

Theory: Probiotics, prebiotics, and synbiotics. Health benefits Probiotics- principle, mechanism, production technology. Role of nutraceuticals in management of health and diseases.

UNIT-IV

(5 Hours)

Extraction and quantification of polyphenols, flavonoids, saponins and alkaloids. 3 Hours

UNIT-V

(6 Hours)

Isolation and Identification of probiotic bacteria, *In-vitro* characterization of probiotics

Text Book(s)

1. L. Rapport and B. Lockwood (2002) Nutraceuticals, 2nd Edition, Pharmaceutical Press.
2. M. Maffei (Ed.) (2003) Dietary Supplements of Plant Origin, Taylor & Francis 3 Nutraceuticals by L. Rapport and B. Lockwood, Pharmaceutical Press.

Reference Book(s)

1. Israel Goldberg (Ed.) (1999) Functional foods, designer foods, pharma foods, Nutraceuticals, Aspen publishers Inc., USA
2. Shahidi and Weerasinghe (Ed.) (2004) Nutraceutical beverages Chemistry, Nutrition and health Effects, American Chemical Society
3. L. Rapport and B. Lockwood (2002) Nutraceuticals, 2nd Edition, Pharmaceutical Press.
4. M. Maffei (Ed.) (2003) Dietary Supplements of Plant Origin, Taylor & Francis

E-Resources

1. Food is Medicine - An introduction to Nutraceuticals
<https://www.researchgate.net/publication/283076818>
2. Phytopharmaceutical applications of Nutraceuticals Functional foods
https://www.researchgate.net/publication/308116783_Phytopharmaceutical_applications_of_Nutraceuticals_Functional_foods
3. Nutraceuticals, Nutritional Therapy, Phytonutrients, and Phytotherapy for Improvement of Human Health: A Perspective on Plant Biotechnology Application
iteseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.321.9494&rep=rep1&type=pdf
4. Effects of Probiotics, Prebiotics, and Synbiotics on Human Health
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5622781/pdf/nutrients-09-01021.pdf>
5. Production of High quality Probiotics by fermentation
https://www.researchgate.net/publication/280057164_Production_of_High_quality_Probiotics_by_fermentation