GONDWANA UNIVERSITY
GADCHIROLI

FACULTY OF SCIENCE AND TECHNOLOGY

Syllabus for the F.Y. B. Sc. SEM.I

Program: FYUGP

Major Course: Biochemistry

(GUGSTUGBCH)

With effect from 2024-25

(As per the National Education Policy 2020)

Bachelor of Science

(Honors/Research)

BIOCHEMISTRY - MAJOR

The discipline of Biochemistry involves the study of the structure and function of biomolecules and the vital processes that occur in living organisms. It is regarded as Mother of all Biological Sciences disciplines because it unveils the chemical basis of life in all living organisms including plants, animals and microorganisms.

Biochemistry has contributed enormously in various fields such as:

- Medical and health science and agriculture.
- Biochemistry has applications in clinical diagnosis, understanding pathology of diseases, treatment of diseases, designing of drugs and understanding their metabolism and manufacture of various biological products like amino acids, proteins, antibiotics, hormones, enzymes, nutrients, etc.
- Developing superior varieties of crop plants with better growth attributes and yield.
- For the estimation of pesticide residues in soil or food grain one has to rely on biochemical tests.
- The functions and roles of various nutrients are described only by biochemistry.
- The composition of food materials including the quality-milk and possible adulterations can be checkedby biochemical tests.
- Valuable role in farming, fishery, poultry, sericulture, bee keeping and in environmental remediation.

Programme outcomes:

At the end of the programme the students undertaking Biochemistry (Honours) course exhibit certain levels of learning outcomes like:

- The students become conversant with the fundamentals of Biochemistry.
- Understanding of discipline, critical thinking, problem solving, analytical and scientific reasoning, research/industry related skills, etc.
- Will empower the students to develop their future career with a much better and meaningful orientation.

TEACHING AND EXAMINATION SCHEME

Gondwana University, Gadchiroli
NEP 2020 U.G. PROGRAMME: SESSION 2024-25
GUGSTUGBCH
Faculty of Science and Technology
Programme Name - B.Sc. Sem I (BIOCHEMISTRY)

Sr. No.	Course Category	Subject code	Subject name	Total Credit	Teaching Scheme (Hrs.)			Examination Scheme									Total Marks
								Theory					Practical				
					Theory	Practical	Total Hrs.	UA	CA	Total Mark	Min. Passing	Duration(Hrs.)	UA	CA	Total Mark	Min. Passing	
1	Core Group Subject-I	STUG01BCH001	Human Physiology	02	02	--	02	40	10	50	20	02	--	--	--	--	50
	Core Group Subject-II		Student shall opt any one subject as core group subject-II from annexure-I other than core subject-I	02	02	--	02	40	10	50	20	02	--	--	--	--	50
	Practical Core Gp Subject-I	STUG01BCH002	Human Physiology Practical	02	--	04	04	--	--	--	--	--	30	20	50	25	50
	Practical Core Gp Subject-II		Practical of the selected core group subject- II	02	--	04	04	--	--	--	--	--	30	20	50	25	50
2	OE	STUG01BCH003	Group-A (Chemical Basis of Life)	02	02	--	02	40	10	50	20	02	--	--	--	--	50
		STUG01BCH004	Group-A (Blood and Blood disorders)														
3	VSC *	STUG01BCH005	Medical Laboratory Techniques	02	--	04	04	--	--	--	--	--	30	20	50	25	50
4	SEC	STUG01BCH006	Basic Biochemistry Laboratory Skills	02	02	--	02	40	10	50	20	02	--	--	--	--	50
5	VEC		Audit course (Only one from Anne V)	02	02	--	02	--	50	50	20	--	--	--	--	--	50
6	AEC		English/Marathi/Hindi/Bengali/Pali	02	02	--	02	40	10	50	20	02	--	--	--	--	50
7	IKS		Generic IKS	02	02	--	02	40	10	50	20	02	--	--	--	--	50
8	CC		NCC/NSS/Yoga/Sports	02	--	04	04	--	--	--	--	--	--	50	50	25	50
				22	14	16	30	240	110	350	140	12	90	110	200	100	550

***Shall be based on Core Group Subject-I**

Note(s):1) As per open elective (OE)is concerned, students shall opt any one from Group-A to be chosen compulsory from faculty other than that of core subject.

2) Generic IKS will be common for all Faculties in the first Semester as per Government letter No. Ø- ,ubih-2022@iz-Ø-09@fof'k&3¼f'kdkuk½ fnukad 25 tkusokjh] 2024-

GONDWANA UNIVERSITY GADCHIROLI

SYLLABUS FOR FYUGP

B.Sc. I (Sem I)

BIOCHEMISTRY

Distribution of courses for B.Sc. Sem I

B.Sc. Sem. I				
Sr.No	**Course Code**	**Course Title**	**Paper Title**	**Credits**
1	STUG01BCH001	Core Group Subject - I (T)	Human Physiology	2
2		Core Group Subject - II (T)	Student shall opt any one subject as core group sub-II from annexure-I other than core subject-I	2
3	STUG01BCH002	Core Group Subject - I (P)	Human Physiology Practical	2
4		Core Group Subject - II (P)	Practical of the selected core group subject- II	2
5	STUG01BCH003	Open Elective (OE)	Group-A (Chemical Basis of Life)	2
	STUG01BCH004		Group-A (Blood and Blood disorders)	
6	STUG01BCH005	VSC	Medical Laboratory Techniques (Based on Major)	2
7	STUG01BCH006	SEC	Basic Biochemistry Laboratory Skills	2
8		VEC	Audit course (Only one from Annexure V)	2
9		AEC	English/Mar/Hin/Bengali etc.	2
10		IKS-Generic	Indian Knowledge System	2
11		CC (Co-curricular)	NCC/NSS/Sports/Yoga etc.	2
		Total		22

GONDWANA UNIVERSITY, GADCHIROLI
SCHEME AND EXAM PATTERN
Bachelor of Science (Honors/Research)
(Biochemistry- Major)

FYUGP (Honors)

B.Sc. SEM I & II

- There shall be two semesters in B.Sc. Part I. Each semester comprises of theory papers, Practicals and internal assessment.
- The syllabus is based on two theory periods and four practical periods per week.
- Each theory paper divided into four units.
- **Scheme of examination:** It is divided into two parts- Internal assessment (college assessment) and external assessment (semester end examination conducted by university).
- The internal assessment marks assigned to each theory paper shall be awarded on the basis of Based on Assignment, Seminar, Unit Test & overall attendance and performance of the student.

The Semester End Examination for Biochemistry course will be as follows:

Total - 100 Marks (4 credit)

40 marks Paper (External assessment- University examination)

10 marks (Internal assessment/College Assessment)

Theory Internal Assessment Marks: 10

(Class Test, Attendance- 5 M)

(Assignment- Charts/Models/Seminar/Project or review work- 5M)

50 marks One practical course (30 marks UA and 20 marks CA)

Practical Internal Assessment Marks: 20

(Based on Attendance, Punctuality, Lab Assignment Submission, Tour/ Field Visit Diary Submission)

Duration of examination for each theory paper will be 2 hours.

The practical examination shall be of 4 hours duration for 1 day.

Question paper will consist of five questions and each question will be of 08 marks.

All questions will be compulsory and with internal choice.

Fifth question will be compulsory with questions from each of the four units having equal weightage and there will be no internal choice.

The marks will be given for all examinations and they will be converted into grade points. The final grade card will have marks, credits, grades, grade points, SGPA& CGPA

GONDWANA UNIVERSITY GADCHIROLI

B.Sc. (BIOCHEMISTRY) SEM I (NEP 20)

THEORY QUESTION PAPER PATTERN

Time: 02 Hours **Total Marks:40**

Note: 1. All questions are compulsory
2. All questions carry equal marks

Q.1 (Based on Unit I)

a) Long Answer 4M
b) Long Answer 4M
OR
a) Short Answer 2M
b) Short Answer 2M
c) Short Answer 2M
d) Short Answer 2M

Q.2 (Based on Unit II)

a) Long Answer 4M
b) Long Answer 4M
OR
a) Short Answer 2M
b) Short Answer 2M
c) Short Answer 2M
d) Short Answer 2M

Q.3 (Based on Unit III)

a) Long Answer 4M
b) Long Answer 4M
OR
a) Short Answer 2M
b) Short Answer 2M
c) Short Answer 2M
d) Short Answer 2M

Q.4 (Based on Unit IV)

a) Long Answer 4M
b) Long Answer 4M
OR
a) Short Answer 2M
b) Short Answer 2M
c) Short Answer 2M
d) Short Answer 2M

Q.5 Write answer in short (Any Eight)

a) Unit - I 1M	b) Unit - I 1M	c) Unit - I 1M
d) Unit - II 1M	e) Unit - II 1M	f) Unit - II 1M
g) Unit - III 1M	h) Unit- III 1M	i) Unit - III 1M
j) Unit - IV 1M	k) Unit - IV 1M	l) Unit - IV 1M

B.Sc. Part I SEM I

CORE GROUP SUBJECT- I

STUG01BCH001

HUMAN PHYSIOLOGY

Total Hours: 30 for theory **Theory per week: 2 Hrs**
Internal Assessment Marks: 10 **Theory Marks: 40**

Course objectives

The course will provide a foundation of the physiological principles.
The objective is to impart knowledge and understanding of the human body.
To understand the inter relationships between physiological systems of the human body.

Unit I: Hematology: -

1. Composition of blood, proteins in plasma and their functions
2. Structure of hemoglobin and its functions
3. Mechanism of transport of $O_2$and CO_2 by blood, Bohr's effect and chloride shift
4. Functions of RBCs, Platelets and WBCs like Neutrophil, Eosinophil, Basophil, Lymphocytes (T & B)and Monocytes.
5. Mechanism of blood coagulation, role of vitamin K in coagulation, anticoagulant.
6. Blood related diseases- Outlines of Iron deficiency anemia, Sickle cell anemia, Thalassemia.

Unit II: Digestion: -

1. Digestion and absorption of: a) Carbohydrates b) Fats c) Proteins.

i. Chemical digestion: enzymes involved and their activation, site of enzyme production and action.Substrate and product of each enzyme catalyzed reaction.

ii. Absorption of glucose, amino acids and fatty acids in the intestine.

Muscles:

1. Brief idea of types of muscle fibers, Structure of striated muscle fiber.
2. Molecular organization of contractile system.
3. Sliding mechanism of muscle contraction.

Unit III: Neurobiology: -

1. Structure of Neurons, types of neurons.
2. Detailed account of impulse generation: Membrane potential, its development, depolarization, repolarization.
3. Conductivity: Transmission of impulse in myelinated and nonmyelinated nerve fiber.
4. Synapse and mechanism of synaptic transmission (Cholenergic and adrenergic transmission).
5. Neurotransmitters- definition, properties and types- serotonin, dopamine, histamine, acetylcholine,GABA.

Reproduction: -

1. Oogenesis, Spermatogenesis, Menstrual cycle.
2. Functions of male and female sex hormones.
3. Brief idea of HCG and its functions.

Unit IV: Endocrinology: -

1. Organization of endocrine system. Classification and chemistry of hormones.
2. Physiological role of hormones of pancreas, thyroid, parathyroid, adrenals, pituitary and hypothalamus.

3. Concept of second messengers like cAMP, cGMP.
4. Basic mechanism of action of Peptide and steroid hormones

References:

1. Human Physiology, Vol. I & II- C. C. Chatterjee – Medical Allied Agency – Calcutta.
2. Concise Medical Physiology – Choudhary – New Central Book Agency – Calcutta.
3. Text Book of Medical Physiology – Guyton – Prism Books Pvt. Ltd. – Bangalore.
4. Harper's Biochemistry – Murray, Granner, Mayes, and Rodwell – Prentice Hall International Inc.
5. Biochemistry – Lehninger – CBS Publishers.
6. William's Textbook of Endocrinology – Larsen, R. P. Korenberg, H. N. Melmed, S. and Polensky, K.
S. Saunders T. B. of Animal Physiology – Berry
7. Introduction to Animal Physiology and Related Biotechnology – H. R. Singh
8. Animal Physiology – Arora, M.P.
9. General and Comparative Physiology – Hoar, W. S.
10. T. B. of Animal Physiology – Hurkat and Mathur
11. Animal Physiology – Naghbhushanam and Kodarkar
12. T. B. of Animal Physiology & General Biology – Thakur &Puranik
13. Mammalian Biochemistry- White, A. Handler, P. and Smith, E. L. McGraw-Hill.
14. Fundamentals of Biochemistry- J.L.Jain, Sunjay Jain, Nitin Jain-S.Chand & Co. Ltd.
15. Biochemistry and Physiology by Dr Veer Bala Rastogi; Kedar Nath Ram Nath, 132, R.G. CollegeRoad, Meerut - 250001 (U.P.), 2022.
16. Biochemistry & Physiology (Theory & Practical), Dr. Beenam Saxena, ISBN: 9789391576028
17. Biochemistry and Physiology, Dr. Dev Brat Mishra, Dr. Kumud Rai; Publisher: Thakur PublicationPvt. Ltd.: 9789354803895; Edition: 1, 2022

CORE GROUP SUBJECT- I

STUG01BCH002

HUMAN PHYSIOLOGY

Practical

Total Hours: 60 for Practical
Per week: 4 Hrs
Duration of Practical Exam: 04 Horus

Total Marks: 50
Practical Marks: 30
Internal Assessment Marks: 20

1. RBC count by haemocytometer.
2. Differential leucocyte counts of blood.
3. Measurement of blood pressure by sphygmomanometer.
4. WBC count by haemocytometer.
5. Estimation of glucose by Benedict quantitative method.
6. Assay of haemoglobin by hemoglobinometer.
7. Determination of ESR of blood.
8. Determination of clotting time of blood by capillary tube method.

Suggested Readings

1. Practical clinical Biochemistry: Methods and Interpretations, Ranjana Chawla; Jaypee Brothers Medical Publishers (P) Ltd.
2. Practical Manual of Biochemistry, Dr. G. Sattanathan, Ph.D., Dr. S.S. Padmapriya, Ph.D., Dr. B. Balamurali Krishnan, Skyfox Publishing Group Skyfox Press, Medical College Road Thanjavur-613004 Tamil Nadu, India.
3.Clinical Biochemistry by R.L.Nath
4. An Introduction to Practical Biochemistry by David T. Plummer.
5. Practical manual of Biotechnology & Biochemistry by Alok Kumar Singh
6. Karp G (2009). Cell and Molecular Biology: Concepts and experiments. 7th edition. John Wiley & Sons.

Distribution of Marks:
Total marks: 30 Duration: 04 Hrs

1. **Experiment ----------10**
2. **Experiment ----------10**
3. **Practical Record----------05**
4. **Viva-voce----------05**

Internal Assessment Marks: 20
(Based on Attendance, Punctuality, Lab Assignment Submission, Tour/ Field Visit Diary Submission)

B.Sc. I SEM I

GROUP A

Open Elective:1

STUG01BCH003

CHEMICAL BASIS OF LIFE

Total Hours: 30 for theory **Theory per week: 2**
Theory Marks: 40 **Internal Assessment Marks: 10**

UNIT I: Introduction to Chemistry of Life:

Chemical bonds: Types, Covalent bonds, non-covalent bonds (Hydrogen bond, Ionic bonds, Vander Waal forces, Ionic bonds), Co-ordinate bonds

Functional groups and Linkage: Carboxyl group, amino group, Hydroxyl group, Sulfhydryl group etc., Ester Linkage, Phosphodiester linkage, Amide linkage

Water: Properties, Water a biological solvent, Self-ionization, Kw, pKw Physiological importance.

Unit – II: Fuel Molecules: Carbohydrates, Lipids

Introduction, Sources, classification and role of Carbohydrates

Introduction, Source, classification and function of Lipids

UNIT III: Elements and Functional Molecules:

Importance of Elements in the biological system

Macro-elements and Microelements: Occurrence and role of elements in cell-

Nitrogen, Sulphur, Phosphorus, Calcium, Iron, Zinc, Iodine.

UNIT IV: Functional molecules of cell: Protein, Nucleic acid

Introduction, Types, Occurrence, Classification and Functions of Proteins

Introduction, Types, Building blocks of Nucleic acids, and role of Nucleic Acid

Reference books:

1. Text Book of Biochemistry 4th Edition By West and Todd
2. Biochemistry (6th Edition) By; Breg J M Tymoczko T J Stryer L
3. Biochemistry D. Voet and Voet J 5th Edition
4. Concept in Biochemistry by Rodney Boyer 2nd Edition
5. Nelson DL and Cox MM; Lehninger's Principles of Biochemistry 6th edition
6. Fundamentals of Biochemistry By J.L.Jain, S.Jain and N.Jain 7th Edition
7. Biochemistry, Satyanarayana & U Chakrapani 6th Edition
8. Fundamentals of Biochemistry BY Deb A.C.

B.Sc. I Semester I

GROUP A

Open Elective:2

STUG01BCH004

BLOOD AND BLOOD DISORDERS

Total Hours: 30 for theory | **Theory per week: 2 Hrs**
Theory Marks: 40 | **Internal Assessment Marks: 10**

Unit I. Blood composition

Composition of blood, proteins in plasma and their functions, Structure and functions of hemoglobin. Functions of RBCs, Platelets and WBCs.

Unit II. Blood disorders that affect red blood cells

Brief idea about Iron-deficiency anaemia, Pernicious anaemia (B12 deficiency), Macrocytic anaemia, Thalassemia, Sickle cell anaemia.

Unit III. Blood disorders that affect white blood cells

Brief idea about Lymphoma, Leukemia, Multiple myeloma. Symptoms.

Unit IV. Blood disorders that affect platelets and blood plasma

Brief idea about Thrombocytopenia, idiopathic thrombocytopenia purpura, Heparin induced thrombocytopenia. Haemophilia. Symptoms.

Suggested Reading:

Essentials of Haematology Shirish M Kawthalkar, Jaypee Brothers Medical Publishers (P) Ltd. New Delhi.
Hematology - Yared Alemu, Alemayehu Atomsa, Zewdneh Sahlemariam Jimma University,2006.
Human Physiology- C.C.Chatterjee, CBS Publishers and distributors Pvt. Ltd.
Medical Physiology- Guyton and Hall, Third South Asia Edition.

B.Sc. I Semester I
Vocational Skill Course (VSC)
STUG01BCH005

MEDICAL LABORATORY TECHNIQUES

Total Hours: 60 for Practical | **Total Marks: 50**
Per week: 4 Hrs | **Practical Marks: 30**
Duration of Practical Exam: 04 Horus | **Internal Assessment Marks: 20**

Course Objectives:

1. Prepare students for practical study in Clinical Biochemistry laboratories.
2. Students able to handle safely every laboratory facility and know troubleshoot measures during laboratory processes.
3. Student able to keep, analyze laboratory data with accuracy.

Learning outcomes:

1. Students will be able to safely practice basic medical laboratory procedures and protocols.
2. Maintain laboratory records compliance with current laboratory standards.

Practical:

1. Principle and working of instruments -light microscope, autoclave, laminar air flow, Colorimeter, PH meter, spectrophotometer, centrifuge, gel electrophoresis unit, Haemoglobinometer etc.
2. Laboratory safety equipment (Fire extinguisher, Fume hood, safety glasses)
3. Calculate number of cells (Blood cells) using hemocytometer.
4. Detection of Bilirubin [Iodine test / Gmelin‟s Nitric acid test / Fouchet‟s test]
5. Detection of Bile salt [Pettenkofer‟s test. Hays sulphur test)]
6. Urine Analysis: Detection of Normal constituents - Urea, Uric acid, Creatinine
7. To analyze the given sample of urine for its normal inorganic constituents.
8. Urine Analysis: Detection of Abnormal constituents – Glucose, Protein
9. Determination of titratable acidity [using neutral red or phenol red]
10. Qualitative analysis of lipids (Triglycerides).
11. Qualitative analysis of lipids (Cholesterol).
12. Estimation of Serum glutamate-oxaloacetate transaminase (S.G.O.T) in blood serum.

13. Estimation of Serum glutamate-pyruvate transaminase (S.G.P.T) in blood serum.

14. Determination of blood groups (ABO & Rh system)

Distribution of Marks:

Total marks: 30 Duration: 04 Hrs
Experiment ----------10
Experiment ----------10
Practical Record----------05
Viva-voce----------05

Internal Assessment Marks: 20
(Based on Attendance, Punctuality, Lab Assignment Submission, Tour/ Field Visit Diary Submission)

Suggested readings:

1. Practical clinical Biochemistry: Methods and Interpretations, Ranjana Chawla; Jaypee Brothers Medical Publishers (P) Ltd.
2. Practical Manual of Biochemistry, Dr. G. Sattanathan, Ph.D., Dr. S.S. Padmapriya, Ph.D., Dr. B. Balamuralikrishnan, Skyfox Publishing Group Skyfox Press, Medical College Road Thanjavur-613004 Tamil Nadu, India.
3.Clinical Biochemistry by R.L.Nath
4. An Introduction to Practical Biochemistry by David T. Plummer.
5. Berg, J.M., Tymoczko, J. L., Stryer, L. (2012). Biochemistry (7th ed.). W.H Freeman and Company (New York).
6. Coico, R., Sunshine, G. (2009). Immunology: A Short Course (6th ed.). John Wiley & Sons, Inc (New Jersey). ISBN; 978-0-470-08158-7.
7. Devlin, T. M., (2011). Textbook of Biochemistry with Clinical Correlations. John Wiley & Sons, Inc. (New York). ISBN: 978-0-4710-28173-4.
8. Prescott, Harley, Wiley, J.M., Sherwood, L.M., Woolverton, C.J. (2008). Klein's Microbiology. (7th ed.). Mc Graw Hill International Edition (New York) ISBN: 978- 007-126727.

B.Sc. I Semester I

Skill Enhancement Course

STUG01BCH006

BASIC LABORATORY SKILLS IN BIOCHEMISTRY

Total Hours: 30 for theory **Theory per week: 2 Hrs**
Theory Marks: 40 **Internal Assessment Marks: 10**

Course Objective:

- To learn fundamental skills important for performing laboratory experiments.

Learning outcomes:

This course will be able to demonstrate basic knowledge and understanding of:

- Good laboratory practices, management of laboratory waste, understanding hazards and risks to ensure a safe laboratory environment.
- Basics of measurements, units and common mathematical calculations, sampling and data collection. Operation and maintenance of instruments.

1: Lab safety and good practices

General laboratory safety, good laboratory practices, biosafety measures (first-aid practices to be followed in case of burn, acid spills and injury), safety symbols, lab safety equipment (fire extinguisher, fume hood, safety glasses), classes of laboratory chemicals, maintenance and handling of chemicals (Labels, Quality - LR/ AR/ Molecular biology grade/ HPLC grade; Expiry date; Precautions for use), Disinfectants, Biocontainment, Disposal of hazardous chemicals, radioactive and biological waste, Laboratory waste management.

2: Use and maintenance of Laboratory equipment

Weighing balance (Top loading and Analytical), pH meter (calibration and use), magnetic stirrer, pipettes and micropipettes, autoclave, incubator shaker, hemocytometer, centrifuge machine, spectrophotometer, electrophoresis units, distillation unit, haemoglobinometer, Chromatography cabinet etc.

3: Measurements and calculations

Units of measurements and conversion from one unit to another, measurement of volumes of liquids, Weighing, calculations: scientific notations, powers, logarithm and fractions.

4: Solutions and Buffers

Molarity, Molality, Normality, percent solution, stock solution, standard solution, dilution, dilution series, pH, acids and bases, buffers - phosphate, Tris- acetate, Tris- Cl and Citrate buffer.

Suggested Readings:

1. Mesh, M.S., Kebede-Westhead, E. (2012). Essential Laboratory Skills for Biosciences. JohnWiley & Sons, Ltd.
2. Mu, P., Plummer, D. T. (2001). Introduction to practical biochemistry. Tata McGraw-HillEducation.
3. Mann, S. P. (2016). Introductory Statistics, 9th edition. Hoboken, NJ, John Wiley and Sons Inc.
4. Danniel, W.W. (1987). Biostatistics. New York, NY: John Wiley Sons.
5. Jones, A.M., Reed, R., Weyers, J. (2016). Practical Skills in Biology, 6th Edition, Pearson
6. Bisen, P.S. (2014). Laboratory Protocols in Applied Life Sciences, 1st edition. CRC Press.

B.Sc. I Sem. I
Indian Knowledge System
IKS (Generic)

GONDWANA UNIVERSITY
GADCHIROLI

FACULTY OF SCIENCE AND TECHNOLOGY

Syllabus for the F.Y. B. Sc. Sem. II

Program: FYUGP

Major Course: Biochemistry

(GUGSTUGBCH)

With effect from 2024-25

(As per the National Education Policy 2020)

TEACHING AND EXAMINATION SCHEME

Gondwana University, Gadchiroli
NEP 2020 U.G. PROGRAMME: SESSION 2024-25
Faculty of Science and Technology
Programme Name - B.Sc. Sem-II (BIOCHEMISTRY)

Sr. No.	Course Category	Subject code	Subject name	Total Credit	Teaching Scheme (Hrs)			Examination Scheme									Total Marks
								Theory					Practical				
					Theory	Practical	Total Hrs.	UA	CA	Total Mark	Min. Passing	Duration (Hrs.)	UA	CA	Total Mark	Min. Passing	
1	**Core Grp Subject-I**	STUG02BCH 001	Cell Biology and Biomolecules	02	02	--	02	40	10	50	20	02	--	--	--	--	50
	Core Grp Subject-II		Student shall opt the same core group subject- II opted in Sem–I (Paper as annexure-VII)	02	02	--	02	40	10	50	20	02	--	--	--	--	50
	Core Grp Subject-I	STUG02BCH 002	Cell Biology and Biomolecules Practical	02	--	04	04	--	--	--	--	--	30	20	50	25	50
	Core Grp Subject-II		Practical of the selected core group subject- II	02	--	04	04	--	--	--	--	--	30	20	50	25	50
2	**Open Elective**	STUG02BCH 003	Group-A (Basics of Microbiology)	02	02	--	02	40	10	50	20	02	--	--	--	--	50
		STUG02BCH 004	Group -A (Health and Wellness)														
		STUG02BCH 005	Group-B (Indigenous system of Health and Medicine)	02	02	--	02	40	10	50	20	02	--	--	--	--	50
		STUG02BCH 006	Group-B (Food Biochemistry)														
3	**VSC ***	STUG02BCH 007	Analysis of Biomolecules	02	--	04	04	--	--	--	--	--	30	20	50	25	50
4	**SEC**	STUG02BCH 008	Bioanalytical Techniques	02	02	--	02	40	10	50	20	02	--	--	--	-	50
5	**VEC**		Audit course (Only one from anex X)	02	02	--	02	--	50	50	20	02	--	--	--	--	50
6	**AEC**		English/Marathi/Hindi/Bengali/Pali	02	02	--	02	40	10	50	20	02	--	--	--	--	50
7	**CC**		NCC/NSS/Yoga/Sports	02	--	04	04	--	--	--	--	--	--	50	50	25	50
Total				**22**	**14**	**16**	**30**	**240**	**110**	**350**	**140**	**16**	**30**	**70**	**100**	**50**	**550**

GONDWANA UNIVERSITY GADCHIROLI

SYLLABUS FOR FYUGP

B.Sc. I (Sem II)

BIOCHEMISTRY

Distribution of courses for B.Sc. Sem II

B.Sc. Sem. II				
Sr.No	**Course Code**	**Course Title**	**Paper Title**	**Credits**
1	STUG01BCH001	Core Group Subject - I (T)	Cell Biology and Biomolecules	2
2		Core Group Subject - II (T)	Student shall opt the same core group subject-II opted in Sem–I (Paper as annexure VII)	2
3	STUG01BCH002	Core Group Subject - I (P)	Cell Biology and Biomolecules Practical	2
4		Core Group Subject - II (P)	Practical of the selected core group subject-II	2
5	STUG02BCH003 STUG02BCH004	Open Elective (OE)	Group-A (Basics of Microbiology) Group -A (Health and Wellness)	2
6	STUG02BCH005 STUG02BCH006		Group-B (Indigenous system of Health and Medicine) Group-B (Food Biochemistry)	2
7	STUG02BCH007	VSC	Analysis of Biomolecules	2
8	STUG02BCH008	SEC	Bioanalytical Techniques	2
9		VEC	Audit course (Only one from Annexure X)	2
10		AEC	English/Mar/Hin/Bengali etc.	2
11		CC (Co-curricular)	NCC/NSS/Sports/Yoga etc.	2
		Total		22

B.Sc. Part I SEM II

CORE GROUP SUBJECT-I

STUG02BCH001

CELL BIOLOGY AND BIOMOLECULES

Total Hours: 30 for theory **Theory per week: 2 Hrs**
Internal Assessment Marks: 10 **Theory Marks: 40**

Course objectives

The objective of this course is to offer insights into the basic structure and function of a cell and cellular organelles. Understand the basic principle of chemistry as well as biology.
The course also aims to impart understanding of cell cycle.
The course aims to provide students with an understanding of biomolecules, the basic building blocks of living organisms.

Unit I: Cell - membrane, transport and division

1. Prokaryotic, Eukaryotic (plant & animal) -a comparative overview
2. Cell membrane (fluid mosaic model)
3. Transport across cell membranes: Diffusion (simple & facilitated), Active transport (Primary& secondary), Endo & Exocytosis
4. Mitosis and Meiosis: Stages of Mitosis and Meiosis.

Unit II: Cell Organelles

1. Structure & function of the nucleus and nucleolus
2. Structure & Function of: Mitochondria, Ribosome, ER, Golgi apparatus
3. Structure and function of the chloroplast (in brief).
4. Peroxisome function & assembly (in brief) and Lysosome structure and function

Unit III: Carbohydrates

1. Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation
2. Reactions of carbohydrates (due to functional groups - hydroxyl , aldehyde and ketone).
3. Amino sugars, Glycosides.
4. Structure and biological importance of disaccharides (sucrose, lactose, maltose), trisaccharide (raffinose), structural polysaccharides (cellulose, chitin) and storage polysaccharides (starch, glycogen).
5. Glycosaminoglycans. Outlines of glycoproteins, glycolipids.

Unit IV: Lipids

1. Definition and classification. Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids.
2. Triacylglycerols: Nomenclature, physical properties, chemical properties and characterization of fats- hydrolysis, saponification value, acid value, rancidity of fats, Iodine number and reaction of glycerol.
3.Glycerophospholipids (lecithin, cephalins, phosphatidylserine, phosphatidylinositol, plasmalogens), sphingomyelins, cerebrosides.

SUGGESTED READINGS

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H.

Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New York), ISBN:978-0-470-28173-4.
3. Lehninger's Principles of Biochemistry – Nelson D.L. and Cox M.M., Freeman & Co.
4. Cell Biology: C.B. Powar; Himalaya Publishing House.
5. Cell Biology, Evolution and Ecology: P.S.Verma, V.K.Agrawal ; S.Chand and Co.
6. Textbook of Biochemistry – West E.S., Todd W.R, Mason H.S. and Bruggen, J.T.V., Oxford & IBH Publishers.
7. Principles of Biochemistry: General Aspects-Smith, E. L., Hill, R.L. Lehman, I. R. Lefkowitz, R.J. Handler, P., and White, A. McGraw-Hill
8. Outlines of Biochemistry – Conn. E.E., Stumpf P.K., Bruening, G and Doi R.H., John Wiley & Sons.
9. Harper's Illustrated Biochemistry – Murray, R.K., Granner D.K. &Rodwell V.W., McGraw-Hill
10. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Ltd.
11. Biochemistry – Rama Rao. A and Ratna Kumari. D, Kalyani Publishers.
12. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co. 1. Cell Biology, Genetics, Mol Biology, Evolution And Ecology, P. S. Verma, 2005, S. Chand
13. Biotechnology (E.H.), B. D. Singh, 2008, Kalyani Publication
14. Cell And Molecular Biology, Gerald Karp, 2007. John Wiley And Sons Pvt.Ltd.
15. Cell Biology, C.B. Powar, 2005, Himalaya Publishing House.
16. Cell Biology, Varma And Agrawal, 2005, S. Chand, Delhi
17. Cell, B. Lewin, 2007, Jones And Bartlett Publisher , London.
18. Cytology, Varma And Agrawal, 2005, S. Chand New Delhi
19. Molecular Biology of Cell - Bruce Alberts et al, Garland publications.

B.Sc. Part I SEM II

CORE GROUP SUBJECT-I

STUG02BCH002

CELL BIOLOGY AND BIOMOLECULES

Practical

Total Hours: 60 for Practical
Per week: 4 Hrs
Duration of Practical Exam: 04 Horus

Total Marks: 50
Practical Marks: 30
Internal Assessment Marks: 20

1) Identification of different stages of mitosis in onion root tip.
2) Visualization of nuclear fraction by acetocarmine stain.
3)Qualitative tests for Carbohydrates- glucose, fructose, maltose, sucrose, lactose, starch/glycogen.
4) Qualitative identification of lipids- solubility, acrolein test, Salkowski test, Lieberman-Burchard test.
5) Colorimetric estimation of cholesterol.
6) Determination saponification value of fats.
7) Determination of acid value of fats.
8) Estimation of vitamin C

Distribution of Marks:

Total marks: 30 Duration: 04 Hrs

1. **Experiment ----------10**
2. **Experiment ----------10**
3. **Practical Record----------05**
4. **Viva-voce----------05**

Internal Assessment Marks: 20
(Based on Attendance, Punctuality, Lab Assignment Submission, Tour/ Field Visit Diary Submission)

Suggested readings:

1. An Introduction to Practical Biochemistry by David T. Plummer.
2. Practical manual of Biotechnology & Biochemistry by Alok Kumar Singh
3. Karp G (2009). Cell and Molecular Biology: Concepts and experiments. 7th edition. John Wiley & Sons.
4. Practical Biochemistry: Damodaran Geetha K, Jaypee Brothers Medical Publishers.
5. Experiments in Microbiology, Plant Pathology and Biotechnology, K.R. Aneja, 2003, New Age Int. Pvt. Ltd.
6. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi. Co. Ltd.
7. Manju Bala, Sunita Gupta, N.K. Gupta & M.K. Sangha (2019) Practicals in Plant Physiology and Biochemistry. ISBN 9789386102638

B.Sc. Part I SEM II

Group A

OPEN ELECTIVE I

STUG02BCH003

BASICS OF MICROBIOLOGY

Total Hours: 30 for theory **Theory per week: 2 Hrs**
Internal Assessment Marks: 10 **Theory Marks: 40**

Course objectives:

1. The objective of the course is to trace the history of development of the discipline of Microbiology.
2. The course also aims to make the students aware of both pathogenic as well as beneficial microbes.
3. To prepare students for higher education in microbiology related disciplines.

Course Outcomes:

After successful completion of this Course, students will be able to:

1. Apply the principles of microscopy to study microorganisms
2. Study ultrastructure of prokaryotic cell, staining techniques
3. Comprehend the importance and methods of sterilization in microbiological work
4. Analyze the different types of media, culture methods and staining techniques for isolation, characterization of microbes.

Unit I: History and development of microbiology:

Contributions of Louis Pasteur, Robert Kochand Edward Jenner.

Microscopy: Compound microscopy: Numerical aperture and its importance, resolving power, oil immersion objectives and their significance

Unit II: Bacterial Morphology and Staining Techniques:

Generalized diagram of typical bacterial cell, Cell wall of Gram positive and Gram-negative cells. Endospores: Study of Endospore structure and Sporulation

Stains and staining Procedure: Definition of Dye, stain. Concept of simple staining, differential staining, Endospore staining.

Unit III: **Microbial growth and nutrition**

Microbial Growth

Growth rate, details of growth curve and its phases.

Concept of synchronous cultures, continuous and batch cultures (chemostat and turbidostat).

Physical conditions required for growth: pH, Temperature. Pure culture: Concept, isolation methods, maintenance, preservation.

Nutrition:

Basic nutritional requirements such as water, carbon, nitrogen, sulfur and vitamins etc. Natural and synthetic media, Media composition. Role of Peptone, Beefextract, NaCl, Agar.

Unit IV: **Microbial Control**

A. Concept of Sterilization, disinfection, antiseptic, sanitization,germicide and antimicrobial agents.

B. Methods of Microbial Control- Physical method (Temperature, Radiation), Chemical method (halogens, alcohol, gaseous sterilization)

Suggested Readings:

- Atlas RM. (1997). Principles of Microbiology. 2nd edition. Wm C Brown Publishers.
- Black JG. (2008). Microbiology: Principles and Explorations. 7th Ed., Prentice Hall
- Dubey & Maheshwari, A Text book of microbiology
- Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Micro-organisms. 14thEd.,Prentice Hall International, Inc.
- Prescott, Harley & Klein, Microbiology
- Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology, 5th Ed., Tata McGraw-Hill.
- Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer AcademicPublishers, Dordrecht
- Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5thEd.,McMillan.
- Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th Ed.,
- Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology, 9th Ed.,McGraw Hill Higher Education.
- Powar C.B. (2010) General Microbiology, Vol.I & II, Himalaya Publishing Co.
- Aneja K.R. - Experiments in Microbiology

B.Sc. Part I SEM II

Group A

OPEN ELECTIVE II

STUG02BCH004

HEALTH AND WELLNESS

Total Hours: 30 for theory **Theory per week: 2 Hrs**
Internal Assessment Marks: 10 **Theory Marks: 40**

Course Outcomes:

1. Students will know about importance of healthy lifestyle.
2. Students will know about physical and mental health.
3. Students will aware about various lifestyle diseases and how to modulate them.
4. Students will aware about stress management techniques.
5. Students will know about importance of yoga and pranayama.

Unit -I: General awareness.

Definition of health and wellness. Factors affecting health and wellness (Social, economic, emotional, occupational, intellectual, physical). Types of Physical Fitness and its Health benefits. Sedentary lifestyle and its risk of disease.

Unit -II: Physiological aspects.

Brief idea about different parts of kidney, heart, brain. LDL in plaque formation. Importance of HDL. International classification of adults underweight, overweight and obesity according to BMI. Parts of respiratory system. Breathing pattern. Stages of breathing in yoga pranayama. Health benefits of Kapalbhati and Anuloma Viloma pranayama.

Unit -III: Nutritional aspects.

Diet and nutrition for health & wellness. Essential components of balanced diet (carbohydrates, proteins, fats, vitamins & minerals) for healthy lifestyle. Malnutrition, under nutrition and over nutrition.

Unit- IV: Healthy foods.

Healthy foods for prevention and progression of Obesity, Diabetes, Polycystic Ovarian Syndrome, Cancer, Cardiovascular diseases and Hypertension. WHO recommendations of healthy diet for adults, infants and young children.

Reference Books:

1. Jesse Peoring Williams “The Principles of Physical Education” Published by College Book House, Shivaji Road, Meerut.
2. William D McArdle, Frank I Katch and Vitor I Katch, Essential of Exercise Physiology, Second edition, New York: LipincoffWelliams and wilkins, 2000.
3. Scott K. Powers and Stephen L. Dodd. Total Fitness: Exercise, Nutrition and wellness, Boston: Allyn and Bacon, 1999.
4. P Sembulingam, K Sembulingam. Essentials of medical physiology. 8th edition. Jaypee Brothers Medical Publishers.
5. Vladimir Gordin. Nutrition and diet The Triangle of health: Chemical components Book 2. Gordin Medical Centre publication.
6. Arvind Upadhyay. Mental health problems. 2nd edition. Notion press publication.
7. James Hewitt. The Complete Yoga Book: The Yoga of Breathing, Posture and Meditation. Ebury Publication.

B.Sc. Part I SEM II
Group B

OPEN ELECTIVE I

STUG02BCH005

INDIGENOUS SYSTEM OF HEALTH AND MEDICINE

Total Hours: 30 for theory **Theory per week: 2 Hrs**
Internal Assessment Marks: 10 **Theory Marks: 40**

Unit I:
History of Indian system of Medicine. Ayurvedic system of Medicine, Concept of health in ayurveda, Concept of pathogenesis, Diagnosis, Treatment aspects.
Unit II: Herbal Medicine, Common medicinal plants and their uses.
Unit III: Folk medicine, Traditional Medicines used by people of Gadchiroli district from Maharashtra.
Unit IV: Research and development, Ayurvedic preparations and drug research, cultivation of medicinal plants, phytochemical studies, pharmacological and toxicological studies.

References

1. The Ayurvedic Pharmacopoeia of India Part-I and Volume-II Ist edition. New Delhi: Ministry of Health and Family Welfare, Govt. of India; 1999. Anonymous.
2. The Ayurvedic Pharmacopoeia of India. Part-I, Volume-III. New Delhi: Ministry of Health and Family Welfare, Govt. of India; 2001. Anonymous.
3. Arora RK, Chawla R, Shikha R, Kumar R, Sharma A, Puri SC, Sinha AK, Tripathi RM, Sharma RK. Radioprotection by Himalayan high-altitude region plants. In: Sharma RK, Arora R, editors. Herbal Drugs: A twenty First century Perspective. New Delhi: JAYPEE Brothers; 2006. pp. 301–325.
4. Billore KV, Yelne MB, Dennis TJ, Chaudhari BG. Database on Medicinal Plants Used in Ayurveda, Volume-6. New Delhi: Central Council for Research in Ayurveda and Siddha; 2004b. Vidari (*Pueraria tuberos*) pp. 441–451.
5. Farooqi AA, Khan MM, Vasundhara M. Natural Remedies. Bangalore, India: 2001. Production Technology of Medicinal and Aromatic Crops; pp. 90–91.
6. Gupta AK, Tandon N, editors. Reviews on Indian Medicinal Plants Vol- I to Vol III. New Delhi: Indian Council of Medical Research; 2004.
7. Harvey SK. Preliminary experimental study of the diuretic activity of some indigenous drugs. Indian J Med Res. 1966;54(8):774–778.
8. Gopal Hamsaveni, Sukumar Saraswathi, Purushotaman KK. Antimalrials from Indian medicinal plants. J Res in Ayurveda Siddha. 1981; II (3):286–295.
9. Jain NK. A textbook of Forensic Pharmacy. Delhi: Vallabh Prakashan; 2001.
10. Traditional Medicinal Plants: AkiNik Publications,169, C-11, Sector - 3, Rohini, Delhi-110085, India. ISBN: 978-93-90846-88-7.

B.Sc. Part I SEM II

Group B

OPEN ELECTIVE II

STUG02BCH006

FOOD BIOCHEMISTRY

Total Hours: 30 for theory **Theory per week: 2 Hrs**
Internal Assessment Marks: 10 **Theory Marks: 40**

Unit 1

Biochemical changes in carbohydrates in food systems, changes in carbohydrates during seed germination, basics of metabolism of carbohydrates; biochemical changes of proteins and amino acids in foods.

Unit 2

Biochemical changes of lipids in foods, changes in lipids in food systems, changes in lipids during cheese fermentation, lipid degradation in seed germination,

Unit 3

Foundations of food processing: transglutaminase activity in seafood processing, proteolysis during cheese fermentation, removal of glucose in egg powder production, production of starch sugars and syrups.

Unit 4

Selected biochemical changes important in the handling and processing of foods, production of ammonia and formaldehyde from trimethylamine and its n-oxide, production of biogenic amines, production of ammonia from urea, adenosine triphosphate degradation, ethylene production in fruit ripening.

Text Books and References:

1. Ashie IA, Lanier TC. 2000. Transglutaminases in seafood processing. In: NF Haard, BK Simpson, editors, Seafood Enzymes. New York: Marcel Dekker, Inc. Pp. 147–166.
2. Berger M. 1994. Flour aging. In: B Godon, C Willm, editors. Primary Cereal Processing. New York: VCH Publishers, Inc. Pp. 439–452.
3. Bewley JD. 1997. Seed germination and dormancy. Plant Cell 9:1055–1066.
4. Bewley JD, Black M. 1994. Physiology of Development and Germination, 2nd ed. New York: Plenum Press. Pp. 293–344.
5. Bryce JH, Hill SA. 1999. Energy production and plant cells. In: PJ Lea, RC Leegood, editors, Plant Biochemistry and Molecular Biology Chichester: John Wiley and Sons. Pp. 1–28.
6. Cadwallader KR. 2000. Enzymes and flavor biogenesis. In: NF Haard, BK Simpson, editors, Seafood Enzymes. New York: Marcel Dekker, Inc. Pp. 365–383.
7. Croteau R, Kutchan TM, Lewis NG. 2000. Natural products (secondary metabolites). In: BB Buchenan, W Grussem, RL Jones, editors, Biochemistry and Molecular Biology of Plants. Rockwell, Maryland: American Society of Plant Physiologists. Pp. 1250–1318.
8. Gopakumar K. 2000. Enzymes and enzyme products as quality indices. In: NF Haard, BK Simpson, editors, Seafood Enzymes. New York: Marcel Dekker, Inc. Pp. 337–363.
9. Grappin R, Rank TC, Olson NF. 1985. Primary proteolysis of cheese proteins during

ripening. J. Dairy Science 68:531–540.
10. Gripon JC. 1987. Mould-ripened cheeses. In: PF Fox, editor, Cheese: Chemistry, Physics and Microbiology. London: Elsevier Applied Science. Pp. 121– 149.
11. Haard CE, Flick GJ, Martin RE. 1982. Occurrence and significance of trimethylamine oxide and its derivatives in fish and shellfish. In: RE Martin, GJ Flick, CE Haard, DR Ward, editors, Chemistry and Biochemistry of Marine Food Products, Westport, Connecticut: AVI Publishing Company. Pp. 149– 304.
12. Haard NF. 1990. Biochemical reactions in fish muscle during frozen storage. In: EG Bligh, editor, Seafood Science and Technology. London: Fishing News Books (Blackwell Scientific Publications, Ltd.) Pp. 176–209.

B.Sc. I Semester II

VOCATIONAL SKILL COURSE

STUG02BCH007

ANALYSIS OF BIOMOLECULES

Total Hours: 60 for Practical
Per week: 4 Hrs
Duration of Practical Exam: 04 Horus

Total Marks: 50
Practical Marks: 30
Internal Assessment Marks: 20

1] Qualitative Analysis of carbohydrates
A. Test for monosaccharides: Glucose, Fructose, Galactose
B. Test for Disaccharides: Maltose, Lactose, Sucrose
C. Test for polysaccharides: Starch, Glycogen

1. Molisch's test	2. Fehling's test	3. Benedict's test	4. Barfoed's test
5. Seliwanoff's Test	6. Osazone test	7. Mucic acid test	8. Silver Mirror test
9. Furfural test	10. Inversion test	11. Iodine test	

2] Qualitative Analysis of Proteins
A. Precipitation of Proteins with Heavy Metals
(1) Mercuric chloride test.
(2) Ferric chloride test.

B. Precipitation of Proteins by Alkaloid Reagents
(1) Sulphosalicyclic acid test.
(2) Esbach's test.
(3) Tannic acid test.
(4) Hellers' test.
(5) Acetic acid-potassium ferrocyanide test.

C. Colour Reactions of Proteins
(1) Biuret reaction.
(2) Ring biuret test.
(3) Xanthoproteic reaction for tyrosine, phenylalanine and tryptophane.
(4) Millon's test for tyrosine.
(5) Aldehyde test for tryptophane.
(6) Glyoxalic acid test for tryptophane.
(7) Hypobomide test for arginine.

(8) Sulphur test for cystine and cysteine.
(9) Ninhydrin test.

3] Qualitative Analysis of Fats and Oils

(1) Solubility test. (2) Acrolin test. (3) Emulsification of fats.

4] Tests for Enzymes

(1) To demonstrate action of salivary enzyme amylase (ptyalin)
(2) To demonstrate action of pepsin on protein.

Distribution of Marks:

Total marks: 30 Duration: 04 Hrs

1. **Experiment ----------10**
2. **Experiment ----------10**
3. **Practical Record----------05**
4. **Viva-voce----------05**

Internal Assessment Marks: 20
(Based on Attendance, Punctuality, Lab Assignment Submission, Tour/ Field Visit Diary Submission)

Suggested Readings:

1. Analytical Biochemistry, 3rdedition, (1998), David Holmes, H. Peck, Prentice-Hall, UK
2. Denise M. Harmening. Laboratory Management, Principles and Processes, D.H. Publishing & Consulting Inc.; Third Edition, 2012
3. Biochemical Calculations, 2nd Ed., (1997), Segel lrvin H; John Wiley and Sons, NY
4. Experimental Biochemistry and Physiology
5. Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001), Palmer Trevor Publisher: Horwood Pub. Co., England.
6. An Introduction to Practical Biochemistry by David T. Plummer.
7. Practical manual of Biotechnology & Biochemistry by Alok Kumar Singh

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B.Sc. I Semester II

SKILL ENHANCEMENT COURSE(SEC)

STUG02BCH008

BIOANALYTICAL TECHNIQUES

Total Hours: 30 for theory **Theory per week: 2 Hrs**
Internal Assessment Marks: 10 **Theory Marks: 40**

Course Objective:

The course introduces students all the major bioanalytical techniques relevant to science students. It covers the theoretical aspects of various techniques, along with their instrumentation and applications.

I. Spectroscopy – Concepts of spectroscopy, Visible and UV spectroscopy, Principles and applications of colorimetry.

II. Centrifugation – Principles of centrifugation, different types of instruments and rotors.

III. Chromatography– Principles of paper, thin layer, ion exchange and affinity chromatography, gel permeation chromatography.

IV. Electrophoretic techniques – Principles of electrophoretic separation, different types of electrophoresis including paper, cellulose, acetate/nitrate and gel.

Students should visit to any Industry or Analytical laboratory.

Recommended books:

1. Analytical Biochemistry (1998) 3rd edition, David Holme and Hazel Peck, Pearson Education Ltd.ISBN: 9780582294387.
2. Physical Biochemistry: Principles and Applications (2010) 2nd edition, Sheehan, D., WileyBlackwell (West Sussex), ISBN: 9780470856024 / ISBN: 9780470856031.
3. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) 2nd edition,Freifelder, D., W.H. Freeman and Company (New York), ISBN:0716713152.
4. An Introduction to Practical Biochemistry (1998) 3rd edition, Plummer D. T., Tata McGraw HillEducation Pvt. Ltd. (New Delhi), ISBN: 9780070994874.
5. Principles and Techniques of Biochemistry and Molecular Biology (2010) 7th edition; Wilson K,Walker J, Cambridge University Press, ISBN: 9780521178747.