

# THE UNIVERSITY OF BURDWAN



**Syllabus for 3- Year Degree / 4- Year Honours**

**in**

**PHYSIOLOGY**

*Under Curriculum and Credit Framework  
For Undergraduate Programmes ( CCFUP )*

*As per NEP, 2020*

*w.e.f. 2023-24*

*Alak Kumar Syamal*

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**SEMESTER WISE AND COURSE WISE CREDIT AND MARKS DISTRIBUTION UNDER CCFUP**  
**AS PER NEP 2020**

**SEMESTER-I**

Course Code	Course Title	Total Credit	Credit Distribution	Total Marks	Marks Distribution
			Lec-Tu-Pract		Th.-Pract.-Int. Assessment
PHSL1011	MJC: Cellular Basis of Physiology	4	3-0-1	75	40-20-15
PHSL1021	MN: Cellular Basis of Physiology	4	3-0-1	75	40-20-15
PHSL1031	MD: Nutrition and Dietetics	3	3-0-0	50	40-0-10
PHSL1051	SEC: Haematological Techniques (Pract)	3	0-0-3	50	0-40-10
	AEC: Arabic /Bengali /Hindi /Sanskrit /Santali /Urdu or Equivt. Course from SWAYAM or UGC Recognized others	2	2-0-0	50	40-0-10
CVA1061	Value Added Course: Environmental Science / Education	4	3-0-1	100	60-20-20
<b>Total in semester I</b>		<b>20</b>		<b>400</b>	<b>400</b>

**SEMESTER-II**

Course Code	Course Title	Total Credit	Credit Distribution	Total Marks	Marks Distribution
			Lec-Tu-Pract		Theory-Pract.-Int. Assessment
PHSL2011	MJC:Circulating Body Fluids	4	3-0-1	75	40-20-15
PHSL2021	MN: Circulating Body Fluids	4	3-0-1	75	40-20-15
PHSL2031	MD: Environmental Physiology and Human Health	3	3-0-0	50	40-0-10
PHSL2051	SEC: Clinical Biochemistry(PRAC)	3	0-0-3	50	0-40-10
ENGL2041	AEC: Functional English	2	--	50	40-0-10
CVA2061	Value Added Course: Understanding India/ Digital and Technological Solutions/ Health and Wellness, Yoga Education, Sports and Fitness	4	3/3-1/0-0/1	100	80/60-0/20-20/0
<b>Total in Semester - II</b>		<b>20</b>		<b>400</b>	
<b>Total in Semester – I+II</b>		<b>40</b>		<b>800</b>	

# SEMESTER–I

## MAJOR COURSE

### MJC: Cellular Basis of Physiology

Course Code: PHSL1011

[Theory: 3 Credits 3 / 40 Marks] [Lecture Hour: 45 Hours]

#### Course Learning Outcomes:

- This course gives a wide knowledge about structure and functions of cell organelle.
- From this course students will gather the knowledge about the cell, tissue, organ and systems.
- The course would fortify to the students to acquire the knowledge about transport across cell membranes and intracellular communications.
- They acquire a concept about cell cycle, cell division, homeostasis and aging process.

#### Subject of the course:

1. Introduction [1 hour]
2. Contribution of Indian Scientists in the field of Physiology and allied health sciences: Subodh Chandra Mahalanobis, Sacchidananda Banerjee, Dilip Mahalanabis, Autar Singh Paintal, John Burdon Sanderson Haldane, Ronald Ross, Upendra Nath Brahmachari, Subhash Mukhopadhyay. [3 hours]
3. General concept of the basic anatomical organization of human body. [2 hours]
4. Structure and Function of Cell Organelle – Plasma membrane, nucleus, mitochondria, ribosome, lysosome, Golgi body, endoplasmic reticulum, peroxisomes, cytoskeletal elements and centrosomes. [12 hours]
5. Transport Across Cell Membranes –Passive, active, carrier mediated, uniport, symport and antiport. [4 hours]
6. Intercellular Communication – Gap junction, tight junction, intercalated disc, desmosomes and cell adhesion molecules. Extracellular matrix components. [4 hours]
7. Tissue, Organ and Systems – General classification, special emphasis on connective tissue and epithelial tissue. Brief idea on organs and systems. [6 hours]
8. Cell Cycle – Definition, different phases of cell cycles, regulation and check points of cell cycle. [4 hours]
9. Cell division
  - a) Mitosis – Phases and significance.
  - b) Meiosis – Phases and significance.
  - c) Special emphasis on homologous, heterologous, chiasma formation, crossing over, recombination and disjunction of chromosome. [5 hours]
10. Apoptosis and Necrosis - Basic concept and mechanism. [2 hours]
11. Aging – Etiology, theories of aging, metabolic changes and management. [2 hours]

# **MJC: Cellular Basis of Physiology (PRACTICAL)**

**Course Code: PHSL1011**

**[Practical: 1 Credit/ 20 Marks] [Practical hour: 30 Hours]**

## **Course Learning Outcomes:**

- From this course students will gathering knowledge about various parts of microscope.
- This practical course will provide wide range of knowledge about histological structure of different organs and glands.
- They will gather knowledge about structural morphology of different types of fresh tissue.

## **Subject of the course:**

1. Introduction on: Principle, working procedure and function of different components of microscope. [2 hours]
2. Introduction on permanent slides - Applied value. [2 hours]
3. Study and identification of stained sections of different mammalian tissues and organs: Bone, cartilage, trachea, lungs, spleen, lymph gland, tongue, oesophagus, stomach, small intestine 9duodenum, jejunum, ileum, large intestine, liver, salivary glands, pancreas, adrenal gland, thyroid gland, kidney, ureter, testes, ovary, uterus, spinal cord, cerebral cortex, cerebellum, skin, cardiac muscle, skeletal muscle, smooth muscle, artery and vein. [18 hours]
4. Examination and staining of fresh squamous epithelium by methylene blue stain. [4 hours]
5. Staining of adipose tissue using Sudan III or IV. [4 hours]

**MINOR COURSE**  
**MN: Cellular Basis of Physiology**

**Course Code: PHSL1021**

**[Theory: 3 Credits / 40 Marks] [Lecture Hour: 45 Hours]**

**Course Learning Outcomes:**

- This course gives a wide knowledge about structure and functions of cell organelle.
- From this course students will gather the knowledge about the cell, tissue, organ and systems.
- The course would fortify to the students to acquire the knowledge about transport across cell membranes and intracellular communications.
- They acquire a concept about cell cycle, cell division, homeostasis and aging process.

**Subject of the course:**

1. Introduction [1 hour]
2. Contribution of Indian Scientists in the field of Physiology and allied health sciences: Subodh Chandra Mahalanobis, Sacchidananda Banerjee, Dilip Mahalanabis, Autar Singh Paintal, John Burdon Sanderson Haldane, Ronald Ross, Upendra Nath Brahmachari, Subhash Mukhopadhyay. [3 hours]
3. General concept of the basic anatomical organization of human body. [2 hours]
4. Structure and Function of Cell Organelle – Plasma membrane, nucleus, mitochondria, ribosome, lysosome, Golgi body, endoplasmic reticulum, peroxisomes, cytoskeletal elements and centrosomes. [12 hours]
5. Transport Across Cell Membranes –Passive, active,carrier mediated, uniport, symport and antiport.. [4 hours]
6. Intercellular Communication – Gap junction, tight junction, intercalated disc, desmosomes and cell adhesion molecules. Extracellular matrix components. [4 hours]
7. Tissue, Organ and Systems – General classification, special emphasis on connective tissue and epithelial tissue. Brief idea on organs and systems. [6 hours]
8. Cell Cycle – Definition, different phases of cell cycles, regulation and check points of cell cycle. [4 hours]
9. Cell division
  - a) Mitosis – Phases and significance.
  - b) Meiosis – Phases and significance.
  - c) Special emphasis on homologous, heterologous, chiasma formation, crossing over, recombination and disjunction of chromosome. [5 hours]
10. Apoptosis and Necrosis - Basic concept and mechanism. [2 hours]
11. Aging – Etiology, theories of aging, metabolic changes and management. [2 hours]

# **MN: Cellular Basis of Physiology (PRACTICAL)**

**Course Code: PHSL1021**

**[Practical: 1 Credit / 20 Marks] [Practical hour: 30 Hours]**

## **Course Learning Outcomes:**

- From this course students will gathering knowledge about various parts of microscope.
- This practical course will provide wide range of knowledge about histological structure of different organs and glands.
- They will gather knowledge about structural morphology of different types of fresh tissue.

## **Subject of the course:**

1. Introduction on: Principle, working procedure and function of different components of microscope. [2 hours]
2. Introduction on permanent slides - Applied value. [2 hours]
3. Study and identification of stained sections of different mammalian tissues and organs: Bone, trachea, lungs, spleen, lymph gland, tongue, oesophagus, stomach, small intestine, large intestine, liver, kidney, salivary glands, pancreas, adrenal gland, thyroid gland, testes, ovary, uterus, spinal cord, cerebral cortex, cerebellum, skin, cardiac muscle, skeletal muscle, smooth muscle, artery and vein. [18 hours]
4. Examination and staining of fresh squamous epithelium by methylene blue stain. [4 hours]  
Staining of adipose tissue using Sudan III or IV. [4 hours]

# **MULTI/INTERDISCIPLINARY COURSE**

## **MD: Nutrition and Dietetics**

**Course Code:PHSL1031**

**[Theory: 3 Credits / 40 Marks] [Lecture Hour: 45 Hours]**

### **Course Learning Outcomes:**

- From this course students will gather the knowledge about the role different nutrients and food on health management and disease prevention.
- The course would fortify to the students to acquire the knowledge about hygiene and health maintenance.
- From this course students will gather the knowledge about the study of health by studying malnutrition and undernutrition
- From this course students will gather the knowledge about vitamin deficiency

### **Subject of the course:**

1. Classification of nutrients, Carbohydrate, protein, fat, vitamin, mineral and water. [2 hours]
2. Macro and micro- elements, deficiency symptoms of vitamins. [10 hours]
3. Composition and nutritional value of common Indian foodstuffs – rice, wheat, pulses, egg, meat, fish and milk. [5 hours]
4. Dietary fibers. Calorie requirement. Concept of ACU. [4 hours]
5. Principle of balanced diet. [4 hours]
6. Diet survey. [4 hours]
7. Malnutrition and its causes - PCM, marasmus, kwashiorkor their prevention. Iron and iodine deficiency. [5 hours]
8. Role of nutrients and food on health management and disease prevention - Hypertension, diabetes, cardiovascular disease, obesity, immunodeficiency disease, anaemia, undernutrition. [8 hours]
9. Concept of health, food hygiene, food style, life style for disease prevention. [5 hours]

# **SKILL ENHANCEMENT COURSE**

## **SEC: Hematological Techniques (PRACTICAL)**

**Course Code: PHSL1051**

**[Practical: 3 Credits / 40 Marks][Practical Hour: 90 hours]**

### **Course Learning Outcomes:**

- This skill enhancement course learner will gain their knowledge about preparation of blood smear, staining along with identification of blood cells.
- From this paper students will increase their knowledge and techniques about total count of RBC and WBC.
- From this paper students will increase their knowledge about occurrence of anaemia

### **Subject of the course:**

- |  |            |
|--|------------|
| 1. Preparation and staining of blood film with Leishman's stain. | [12 hours] |
| 2. Identification of the blood corpuscles.                       | [8 hours]  |
| 3. Differential count of WBC.                                    | [10 hours] |
| 4. Total count of RBC and WBC.                                   | [6 hours]  |
| 5. Bleeding time and clotting time.                              | [8 hours]  |
| 6. Hemoglobin estimation.  | [8 hours]  |
| 7. Preparation of haemin crystals.                               | [6 hours]  |
| 8. Preparation and staining of bone marrow.                      | [8 hours]  |
| 9. Measurement of diameter of megakaryocyte.                     | [10 hours] |
| 10. Reticulocyte staining.                                       | [6 hours]  |
| 11. Blood group determination.                                   | [8 hours]  |



**SEMESTER-II**  
**MAJOR COURSE**  
**MJC:Circulating Body Fluids**

**Course Code: PHSL2011**

**[Theory: 3 Credits / 40 Marks] [Lecture Hour: 45 Hours]**

**Course Learning Outcomes:**

- From this course students will gain the knowledge about blood and its components.
- This course will enrich the learner about the morphology, classification and important function of formed elements.
- Student will acquire the knowledge on hemostatic mechanism and the clinical aspects of blood coagulation.
- The students will gain their knowledge on blood group, blood transfusion and its related health hazards.
- Understanding of pre-marital counselling on the basis of knowledge of blood group

**Subject of the course:**

1. Introduction. [2 hours]
2. Blood – Components and general function. [2 hours]
3. Plasma - Composition and function. [2 hours]
4. Plasma proteins - Origin, synthesis, classification and function. [2 hours]
5. Blood volume and measurement of blood volume. [4 hours]
6. Bone Marrow – Red and yellow. [2 hours]
7. Blood Cells-their morphology and functions. [4 hours]
8. Red Blood Cells – Erythropoiesis; hemoglobin-types, synthesis and fate.  
Brief idea on Anaemia, polycythemia and hemoglobinopathies and Thalassemia.  
Brief idea on MCV, MCH, MCHC and colour index. [6 hours]
9. White Blood Cells – Morphology, classification, life cycles, functions, Human leucocyte antigen (HLA). Leucopoiesis, Arneeth index. [6 hours]
10. Platelets - Formation and fate. [2 hours]
11. Hemostasis – Definition, factors, modern concept and abnormalities in hemostasis. Anticoagulants used in different purposes. [4 hours]
12. Blood Grouping- ABO and Rh typing. Cross matching (Major and minor cross matching), blood transfusion and transfusion related hazards. [3 hours]
13. Lymph – Formation, circulation and function. [3 hours]
14. Separation of different components of blood in blood bank and their clinical importance. [3 hours]

# MJC: Circulating Body Fluids (PRACTICAL)

Course Code: PHSL2011

[Practical: 1 Credit / 20 Marks] [Practical hour: 30 Hours]

## Course Learning Outcomes:

- The course content will develop skill of our students on hematological techniques.
- Student will gain the knowledge on total count of RBC and WBC.
- They will increase their skill on blood film preparation and staining procedure.
- Student will develop their knowledge on blood group detection and Rh typing.

## Subject of the course:

1. Preparation and staining of blood film with Leishman's stain and identification of blood cells. [6 hours]
2. Differential count of WBC. [4 hours]
3. Total count of RBC and WBC. [4 hours]
4. Bleeding time and clotting time. [2 hours]
5. Hemoglobin estimation by Sahli's method. [2 hours]
6. Preparation of haemin crystal. [2 hours]
7. Blood group determination and Rh typing. [2 hours]
8. ESR measurement by Wintrobe's or Western green method. [4 hours]
9. Determination of haematocrit, MCV, MCH, MCHC, bleeding time and clotting time. [4 hours]

# MINOR COURSE

## **MN:Circulating Body Fluids**

**Course Code: PHSL2021**

**[Theory: 3 Credits / 40 Marks] [Lecture Hour: 45 Hours]**

### **Course Learning Outcomes:**

- From this course students will gain the knowledge about blood and its components.
- This course will enrich the learner about the morphology, classification and important function of formed elements.
- Student will acquire the knowledge on hemostatic mechanism and the clinical aspects of blood coagulation.
- The students will gain their knowledge on blood group, blood transfusion and its related health hazards.
- Understanding of pre-marital counselling on the basis of knowledge of blood group

### **Subject of the course:**

- |  |           |
|--|-----------|
| 15. Introduction.  | [2 hours] |
| 16. Blood – Components and general function.   | [2 hours] |
| 17. Plasma - Composition and function.   | [2 hours] |
| 18. Plasma proteins - Origin, synthesis, classification and function.  | [2 hours] |
| 19. Blood volume and measurement of blood volume.  | [4 hours] |
| 20. Bone Marrow – Red and yellow.  | [2 hours] |
| 21. Blood Cells-their morphology and functions.  | [4 hours] |
| 22. Red Blood Cells – Erythropoiesis; hemoglobin-types, synthesis and fate.<br>Brief idea on Anaemia, polycythemia and hemoglobinopathies and Thalassemia.<br>Brief idea on MCV, MCH. MCHC and colour index. | [6 hours] |
| 23. White Blood Cells – Morphology, classification, life cycles, functions, Human leucocyte antigen (HLA).Leucopoiesis, Arneth index.<br>[6 hours]   |           |
| 24. Platelets - Formation and fate.[2 hours]   |           |
| 25. Hemostasis – Definition, factors, modern concept and abnormalities in hemostasis.<br>Anticoagulants used in different purposes.  | [4 hours] |
| 26. Blood Grouping- ABO and Rh typing.Cross matching (Major and minor cross matching),<br>blood transfusion and transfusion related hazards.   | [3 hours] |
| 27. Lymph – Formation, circulation and function.   | [3 hours] |
| 28. Separation of different components of blood in blood bank and their clinical importance.   | [3 hours] |

# MN: Circulating Body Fluids (PRACTICAL)

Course Code: PHSL2021

[Practical: 1 Credit / 20 Marks] [Practical hour: 30 Hours]

## Course Learning Outcomes:

- The course content will develop skill of our students on hematological techniques.
- Student will gain the knowledge on total count of RBC and WBC.
- They will increase their skill on blood film preparation and staining procedure.
- Student will develop their knowledge on blood group detection and Rh typing.

## Subject of the course:

10. Preparation and staining of blood film with Leishman's stain and identification of blood cells. [6 hours]
11. Differential count of WBC. [4 hours]
12. Total count of RBC and WBC. [4 hours]
13. Bleeding time and clotting time. [2 hours]
14. Hemoglobin estimation by Sahli's method. [2 hours]
15. Preparation of haemin crystal. [2 hours]
16. Blood group determination and Rh typing. [2 hours]
17. ESR measurement by Wintrobe's or Western green method. [4 hours]
18. Determination of haematocrit, MCV, MCH, MCHC, bleeding time and clotting time. [4 hours]

## MULTI/INTERDISCIPLINARY COURSE

### **MD: Environmental Physiology and Human Health**

Course Code: PHSL2031

[Theory: 3 Credits / 40 Marks] [Lecture Hour: 45 Hours]

#### **Course Learning Outcomes:**

- This course will help our students to enhance their skill to measure dissolved oxygen in water sample.
- They will be able to measure relative humidity and suspended particulate matter in air.
- Lerner will also get their skill to measure noise and light intensity of different working places.
- From this discipline specific elective course student will also develop their ability to measure the soil pH in different climatic areas.

#### **Subject of the course:**

1. Basic concept of environment and its components. Interrelationship of different components of an environment. [2 hours]
2. Pollutants: Definition and types. [2 hours]
3. Air pollution: Definition, source, effects of air pollutant (SO<sub>x</sub>, NO<sub>x</sub>, CO<sub>x</sub> and particulate matter) on human health and their control in brief. [5hours]
4. WaterPollution: Definition, types, waterpollutants-sources, healthhazards, preventive measures. Biological Oxygen Demand(BOD),conceptofsafedinkingwater standards. [4 hours]
5. Pesticides, fungicides and herbicides and human health. [4 hours]
6. Heavy metals (arsenic, fluoride, mercury and lead) and halide (fluoride) pollution and effect on human health. [8 hours]
7. SoundPollution: Definition, concept ofnoise, sourceofsoundpollution, effectsonhumanhealth, preventive measures ofsoundpollution, noiseindex and noisestandards. [4 hours]
8. SoilPollution: Causes, healthhazards, control of soil pollution, solidwaste management- Bioremediation and Phytoremediation. [4 hours]
9. RadioactivePollution: Ionizingradiations, effectsofionizingradiationonhumanhealth, permissible doses and controlling measure. [2 hours]

## **SKILL ENHANCEMENT COURSE**

### **SECP-2: Clinical Biochemistry (PRACTICAL)**

**Course Code: PHSL2051**

**[Practical: 3 Credits / 40 Marks][Practical Hour: 90 hours]**

#### **Course Learning Outcomes:**

- Student will be developing their hands on knowledge on principle and application of colorimeter and spectrophotometer.
- Learner will gain their ideas on pathophysiological significance of blood parameters.
- From this course learners will acquire their knowledge on pathological significance of some enzymes and proteins.

#### **Subject of the course:**

1. Discussion on Principle and application of colorimeter and spectrophotometer. [8 hours]
2. Discussion on Pathophysiological significance of blood parameters – Glucose, serum protein, albumin, urea, creatinine, uric acid, bilirubin and ketone bodies. [12 hours]
3. Discussion on Alteration of lipid and thyroid profile in health and disease. [8 hours]
4. Discussion and Demonstration on Strength of solution: Normality and molarity with calculation. [8 hours]
5. Discussion on Pathological significance of some enzymes and proteins: Lactate dehydrogenase, glucose-6-phosphate dehydrogenase, creatin kinase, amylase, ACP, ALP, Beta-glucuronidase, ALT, AST, Lipase, Gamma-glutamyl transpeptidase, cardiac troponins and CRP. [18 hours]
6. Estimation of
  - a) Blood glucose by GOD-POD method. [10 hours]
  - b) Serum cholesterol. [8 hours]
  - c) SGPT, SGOT. [10 hours]
  - d) Serum alkaline phosphatase by standard biochemical kit. [8 hours]

## Suggested Readings:

1. Textbook of Medical Physiology, by A. C. Guyton. W. B. Saunders Co.
2. Best & Taylor's Physiological Basis of Medical Practice, O. P. Tandon & Y. Tripathi, Lippincott Williams & Wilkins
3. Ganong's Review of Medical Physiology. Barrett et al, McGraw Hill Lange
4. Harper's Illustrated Biochemistry, V. W. Rodwell and others, Lange
5. Lehninger's Principles of Biochemistry. By D. L. Nelson and M. M. Cox, Worth Publishers Inc.
6. Textbook of Medical Physiology, D. Venkatesh & H. H. Sudhakar, Wolters Kluwer
7. Textbook of Biochemistry, by E. S. West. W. R. Todd. H. S. Mason. J. T. Van Bruggen. The Macmillan Company.
8. Biochemistry, D. Das, Academic Publishers.
9. Biophysics and Biophysical Chemistry, D. Das. Academic Publishers.
10. Samson Wright's Applied Physiology, C. A. Keele. E. Neil & N. Toels. Oxford University Press.
11. Physiology, R. M. Berne & M. N. Levy, C. V. Mosby Co.
12. Basic Histology, L. C. Junqueira & J. Carneiro, McGraw-Hill.
13. di Fiore's Atlas of Histology, V. P. Eroschenko, Wolters-Kluwer
14. The Cell – A Molecular Approach, G. M. Cooper & R. E. Hausman, ASM Press SINAUER.
15. Cell Biology, G. Karp, John Wiley & Sons, Inc.
16. Core Textbook of Neuro-Anatomy, by M. B. Carpenter; the Williams and Wilkins Company.
17. The Human Nervous System, by Charles Nobach, McGraw Hill Book Co.
18. The Human Nervous System. By M. L. Barr & J. A. Kierman, Harper & Row.
19. Essential Food and Nutrition, by M. Swaminathan. The Bangalore Printing & Publishing Co.
20. Cell & Molecular Biology, EDP De Robertis & EMF De Robertis; Lea & Febiger
21. Molecular Biology of the Gene, by J. D. Watson, H. H. Nancy & others; Benjamin Cummings.
22. Molecular Biology of the Cell, B. Alberts and others, Garland.
23. Textbook of Medical Physiology, Indu Khurana, Elsevier
24. Textbook of Medical Biochemistry, R. Chawla et al, Wolters-Kluwer
25. Biochemistry, J. M. Berg, J. L. Tymoczko & L. Stryer, W. H. Freeman
26. William's Textbook of Endocrinology Larsen et al An Imprint of Elsevier.
27. Endocrinology, Mac E. Hadley, Pearson Education.
28. Vander's Human Physiology, E. P. Widmaier et al., McGraw-Hill, Higher Education.
29. Concise Medical Physiology by S. K. Chaudhuri, New Central Book Agency.
30. Medical Physiology by A. B. Mahapatra, Current Books International.
31. Endocrinology. Vols. I, II and III by L. O. De Groot. W. B. Saunders Co.
32. Langman's Medical Embryology by J. W. Sadler, Lippincott Williams and Wilkins.
33. Essentials of Human Embryology by A. K. Datta. Current Books International.
34. Human Embryology by I. Singh & G. P. Pal, McMillan.
35. Human Physiology An Integrated Approach by D. U. Silverthorn, Pearson.
36. Practical Haematology. Dacie and Lewis, Churchill & Livingstone, 10th edition.
37. Essential Haematology. A. V. Hoffbrand, J. E. Pettit, PHA Moss and Hoffbrand V. 4<sup>th</sup> edition. Blackwell Scientific Publications
38. Ronald Hoffman, Edward J. Benz Jr., Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi - Hematology: Basic Principles and Practice, Elsevier Health Sciences. 39. Essentials of Biostatistics and Research Methodology by Indranil Saha and Bob Paul, 4<sup>th</sup> Edition, Academic Publishers.