BANKURA UNIVERSITY

(West Bengal Act XIX of 2013- Bankura University Act, 2013)

Main Campus, Bankura Block-II, P.O.: Purandarpur, Dist.: Bankura, Pin- 722155, West Bengal

Office of the Secretary

Faculty Council for Undergraduate Studies

Ref: BKU/FCUG/172/2025 Date: 01/07/2025

NOTIFICATION

As directed, the undersigned is pleased to inform all concerned that Bankura University has initiated the process to implement New Curriculum and Credit Framework for Undergraduate Programme, UGC 2022 (as per NEP 2020) for 4-years Undergraduate programme with Physiology as Major, Minor etc. from the academic session 2023-2024. The syllabus as framed / drafted and partially implemented deserves to be analysed after receiving feedback from different stakeholders. As an important corollary to the process, a workshop will be organized on the date mentioned herewith to get the feedback from the stakeholders. Present Students, Alumni, Guardians, Academicians and other stakeholders related to the specific programme/course are requested for their kind participation in the workshop and to present their views/ observations, etc. The stakeholders may go through the draft syllabus attached herewith and convey their observations to the office of the undersigned on ugsecretaryoffice@bankurauniv.ac.in within seven days from the date of publication of this notice.

Date: 4th July, 2025

Time: 12 noon

Google Meet joining link: https://meet.google.com/gbc-yzqh-ocp

Sd/-
Dr. Arindam Chakraborty
Secretary
Faculty Council for Undergraduate Studies

SEMESTER–V

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/PHY/ 501/MJC-9	MJCT-9: Physiology of Nervous System MJCP-9: Physiology of Nervous System Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 502/MJC-10	MJCT-10: Special Senses MJCP-10: Special Senses Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 503/MJC-11	MJCT-11: Microbiology and Immunology MJCP-11: Microbiology and Immunology Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 504/MJC-12	MJCT-12: Human Nutrition and Dietetics MJCP-12: Human Nutrition and Dietetics Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 505/MN-5	MNT-5: Neuro-muscular Physiology MNP-5: Neuro-muscular Physiology Lab	3 1	10	25 15	50	3	NA	2
ACS/ 506/INT-3	INT-3: Internship**	2	NA	50	50	NA	NA	4 hours/ Week. Total 60 Hours
Total in Semester – V		**22**	**60**	**240**	**300**	**15**		**10**

N.B. MJC – Major Core, MN – Minor; INT- Internship **(Mandatory)

Theory: - 1 Credit= 1 hour/Week, Practical: - 1 Credit= 2 hours/Week, Tutorial: - 1 Credit= 1 hour/Week

SEMESTER–V

MJCT-9: Physiology of Nervous System

Course Code: S/PHY/501/MJC-9 **Course ID: 52511**

[Theory: Credits 3 (3 Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- Students will develop their knowledge on structure and function of nervous tissues, synapse, neuromuscular junction and transmission through such junctions.
- From this core paper they will learn about the reflexes, structure and functions of different parts of the brain.
- Content will provide information about visceral homeostasis maintenance through autonomic nervous system.
- They will have specific knowledge on human body's reflexogenic activities and their controlling measures.
- Content will help to gather knowledge about coordinating activities of these system and stimulus-response coupling process of the body with micro and macro environment.

1. **Structural and functional organization of the nervous system - Classification of nervous system**

2. **Elementary idea on brain and spinal cord**
   a. Structural organization of different parts of brain and spinal cord.

3. **Reflexes**
   a. Introduction of Reflex - Conditioned, unconditioned, mono synaptic, disynaptic and poly synaptic. Reflex arc - Component.
   b. Monosynaptic reflexes: The stretch reflex.
   c. Polysynaptic Reflexes: The withdrawal reflex.
   d. General properties of reflexes.

4. **Cutaneous, deep & visceral sensory and motor pathways**
   a. Ascending and descending tracts: Origin, course, termination and functions.
   b. Functions of the spinal cord with special reference to functional changes - Following hemisection and complete section of spinal cord.
   c. Physiology of pain, origin of pain, perception, regulation, pain pathway and Gate control theory. Referred pain.

5. **Structure and functions of different parts of the brain**

   a. Introduction
   b. The reticular formation and the reticular activating system.
   c. Cerebral cortex – Structure, important areas and their function.
   d. Evoked cortical potentials.
   e. The electroencephalogram. Physiological basis of EEG and abnormal EEG pattern.
   f. Neuro-physiological basis of sleep.

g. Thalamus - Structure, different nuclei, neural connection, function and abnormalities.
h. Cerebellum - Structure, different nuclei, neural connection, function and applied aspects.
i. Basal ganglia – Nuclei, neural connection, function and applied aspects.
j. Role of cerebellum, basal ganglia and vestibular apparatus on postural control and movement.
k. Different movement disorders (Ataxia, Chorea, Athetosis, Huntington diseases and Parkinson disease).

6. The autonomic nervous system

a. Introduction
b. Anatomic organization of autonomic outflow.
c. Chemical transmission, responses of effector organs to autonomic nervous system.
d. Cholinergic and adrenergic discharge**.**

7. Central regulation of visceral function

a. Introduction
b. Medulla oblongata.
c. Hypothalamus
i. Anatomic considerations.
ii. Nuclear organization, connection and function.

8. Neural basis of instinctual behaviour and emotion

a. Introduction
b. Anatomic consideration of limbic system.
c. Limbic system in sexual behavior, fear and rage phenomenon.

9. Higher functions of the nervous system

a. Introduction
b. Learning – General concept; Memory – Short term and long term.
c. Functions of the neocortex.
d. Disorders relating learning and memory.

MJCP-9: Physiology of Nervous System Lab

Course Code: S/PHY/501/MJC-9 **Course ID: 52521**

[Practical: Credit 1/ (2 Practical Classes/Week) /Marks 15] **1 Credit**

Course Learning Outcomes:

- The learner will gain the hand-based work performance endurance assessment skill through various reflex related functioning of human body with their normal and abnormal interpretations.
- Student will be able to gather accurate idea on short term memory retaining capacity testing and on visual acuity.
-

List of Practical

1. Experiments on superficial (Plantar) and deep (Knee Jerk) reflex
2. Measurement of hand grip strength
3. Reaction time by stick drop test
4. Short term memory test (Shape, picture word)
5. Two-point discrimination test

Suggested Readings:

1. Chatterjee, C.C. (2016). Human Physiology Volume 2. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
2. Mahapatra, A.B.S. (2014). Essentials of Medical Physiology. Fourth Edition. Current Books International.
3. Sembulingam, K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.
4. Khurana, I. (2015). Medical Physiology. 2nd Edition. Elsevier India.
5. Core Text Book of Neuro-Anatomy, by M.B. Carpenter: the Williams and Wilkins Company.
6. Berg, J.M. Tymoczko, J.L. Stryer, L. (2006). Biochemistry: International Edition
7. Charles Nobach. The Human Nervous System. Mc Graw Hill Book Co.
8. Berne, R.M. and Levy M.N. Physiology. C.V. Mosby Co.
9. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.
10. Barrett, K. E. Barman, S.M., Boitano, S. Brooks, H.L. (2012). Ganong's Review of Medical Physiology. 24th Edition. Lange Medical Book. Prentice-Hall International.
11. Pal, G.K. Pal, P. (2013). Textbook of Practical Physiology. Third Edition. Universities. Shepherd. G.M. Neurobiology. Oxford University Press.
12. Chadha, P.V. Handbook of Experimental Physiology and Biochemistry. Jaypee Brothers Medical Publishers.
13. Debnath J. Byabaharik Sharir Bignan. *Shreedhar* Prokashani, Kolkata.

MJCT-10: Special Senses

Course Code: S/PHY/502/MJC-10 **Course ID: 52512**

[Theory: Credits 3 (3 Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- From this core course students will gain their knowledge about elementary ideas on visual process, photochemical changes of retina and errors in visual process.
- They will gather specific knowledge about auditory pathway and equilibrium of hearing process.
- The students will also know about the physiology behind smell and taste perception.

1. Introduction to special senses

2. Vision

a. Introduction
b. Anatomic considerations of eye.
c. Histological structure of retina. Structure and functions of rod and cone cells.
d. Errors of refraction. The image forming mechanism (accommodation and visual acuity), light adaptation and dark adaptation.
e. Photochemical changes in retina. Genesis of electrical responses, photopic and scotopic vision.
f. Visual pathways and effects of lesions of these pathways.
g. Color vision, theories of colour vision and colour blindness.
h. Other aspects of visual function – Monocular and binocular.
i. Types of muscles involving eye movements – Lateral and rotational movements and their applied aspects.

3. **Hearing and equilibrium**

a. Introduction
b. Anatomic considerations of ear.
c. Mechanism of hearing.
d. Auditory pathway.
e. Electrical activity in the cochlea.
f. Vestibular function.
g. Loss of hearing – Audiometry, test for conductive deafness, neural deafness and central deafness. Role of ear on equilibrium and posture.

4. Smell and taste

a. Introduction
b. Smell - Receptors and pathways.
c. Physiological basis of olfaction and its applied aspects.
d. Physiology of Taste – Taste bud, basic modalities of taste.
    i. Receptor and pathways
    ii. Physiology of taste, taste adaptation and masking effect.
    iii. Applied aspects.

MJCP-10: Special Senses Lab

Course Code: S/PHY/502/MJC-10 **Course ID: 52522**

[Practical: Credit 1/ (2 Practical Classes/Week) /Marks 15] **1 Credit**

Course Learning Outcomes:

- The learner will increase their abilities and gather knowledge through fixation and staining processes of nervous tissue.
- They will develop their skill to measure visual acuity, colour blindness and tuning fork test for deafness.
- Student will be able to gather preliminary idea on audiometry through demonstration.

1. Principles of fixation and staining
2. Staining and identification of fixed nervous tissue
3. Silver nitrate preparation of corneal cell space
4. Determination of visual acuity by Snellen's chart / Landolt's C chart
5. Determination of colour blindness by Ishihara chart
6. Perimetry
7. Determination of deafness by tuning fork test
8. Demonstration on hearing threshold by audio meter

Suggested Readings:

1. Chatterjee, C.C. (2016). Human Physiology Volume 1 and II. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
2. Hall J.E. (2016).
3. Mahapatra, A.B.S. (2014). Essentials of Medical Physiology. Fourth Edition. Current Books International.
4. Sembulingam, K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.
5. Khurana, I. (2015). Medical Physiology. 2nd Edition. Elsevier India.
6. Core Text Book of Neuro-Anatomy, by M.B. Carpenter: the Williams and Wilkins Company.
7. Berg, J.M. Tymoczko, J.L. Stryer, L. (2006). Biochemistry: International Edition
8. Charles Nobach. The Human Nervous System. Mc Graw Hill Book Co.
9. Berne, R.M. and Levy M.N. Physiology. C.V. Mosby Co.
10. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.

11. Barrett, K. E. Barman, S.M., Boitano, S. Brooks, H.L. (2012). Ganong's Review of Medical Physiology. 24th Edition. Lange Medical Book. Prentice-Hall International.
12. Pal, G.K. Pal, P. (2013). Textbook of Practical Physiology. Third Edition. Universities. Shepherd. G.M. Neurobiology. Oxford University Press.
13. Chadha, P.V. Handbook of Experimental Physiology and Biochemistry. Jaypee Brothers Medical Publishers.
14. Debnath J. Byabaharik Sharir Bignan. *Shreedhar* Prokashani, Kolkata.
15. Mukherjee, K.L. (2004). Medical Laboratory Technology. Vol. I, Vol. II and Vol. III. Tata McGraw-Hill.
16. Manna, M.K. (2005). Practical Physiology. 1st Edition. Sritara Prakasani.

MJCT-11: Microbiology and Immunology

Course Code: S/PHY/503/MJC-11 **Course ID: 52513**

[Theory: Credits 3 (3 Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- From this core course student will develop their knowledge about microbes, classification of microbes and their growth.
- This course will fortify our students to develop their knowledge about bacterial metabolism and reproduction.
- They will get elementary idea on bacterial growth interfering agents.
- This course will provide knowledge about COVID-19.
- Students will improve their knowledge about different types of immunity and universal immunization protocol against diseases.
- Students will be enriched about the techniques for immunomodulation.

Microbes

1. Brief introduction about microbes, structure and morphological classification of different microbes and bacterial spore, plasmid and cosmid.
2. Gram positive, Gram negative, pathogenic and nonpathogenic bacteria.
3. Brief idea on acid-fast stain and acid fast bacteria.
4. Bacterial nutrition, bacterial culture media, bacterial growth curve and factors affecting growth curve.
5. Bacterial genetics – Conjugation, transformation and transduction.
6. Bacterial metabolism – Fermentation (Ethanol and lactic acid) and Entner-Doudoroff pathway and their importance.
7. Elementary idea of bacteriostatic, bactericidal agents, antibiotics, antibiotic resistance and sensitive bacteria.
8. Sterilization and Pasteurization.
9. Viruses - Structure and types, lytic and lysogenic cycles, effect of RNA virus on human body system. Prions – Basic ideas and prion diseases.
10. Basic concept of COVID-19, causative agents, transmission, pathogenesis, sign and symptoms. Co-morbidities of COVID-19. Ideas about CT value.

Overview of immune system

1. Introduction about immune system and immune organs (Primary and secondary).
2. Classification of immunity- Innate and acquired immunity, humoral and cell mediated immunity, natural and artificial immunity and herd immunity.
3. Immuno-competent cells - B lymphocytes and T lymphocytes and APC.

4. Major Histocompatibility Complex (MHC): Type – I & II and interferon.
5. Immunoglobulin - Classification, basic structure and function.
6. Antigen-antibody interaction - Different types (Precipitation, coagulation, agglutination, neutralization and flocculation).
7. Cytokines, lymphokines, inflammation and hypersensitivity and its types.
8. Activation of complement system - Pathways (brief concept of classical and alternative pathway). Brief idea on MAC complex.
9. Vaccination – Principles, Universal protocol on Immunization-brief idea, primary and secondary reaction of vaccination, health reaction due to vaccination, memory cell formation due to vaccination and importance of immunization and concept on booster dose.
10. Basic principles of immunological techniques and their application - RIA and ELISA.
11. Immunopathology - Basic principles of autoimmune disease (Type I diabetes, Hashimoto disease, SLE, Myasthenia gravis and Graves' disease).
12. AIDS- Causative virus, mode of transmission, effects on human body and preventive measures.
13. Basic idea on immuno-suppression, immunodeficiency and immuno-boosting.

MJCP-11: Microbiology and Immunology Lab

Course Code: S/PHY/503/MJC-11 **Course ID: 52523**

[Practical: Credit 1/ (2 Practical Classes/Week) /Marks 15] 1 Credit

Course Learning Outcomes:

- The course content will enable our students to develop their ability of bacterial identification through Gram staining.
- The core course will enrich the students to develop their skill for preparing microbial culture media and quantification of microbes.
- Learner will gain the techniques of antigen antibody reaction through blood grouping and Rh typing.
- They acquire their ideas on radial immuno-diffusion and Acid-fast staining of bacteria through demonstration process.

1. Gram staining of bacteria and identification of Gram positive and Gram-negative bacteria.
2. Blood grouping and Rh typing.
3. Bacterial spore staining.
4. Preparation of bacteria culture media and single colony isolation techniques.
5. Demonstration: Radial immuno-diffusion (RID) and Acid-fast staining of bacteria.

Suggested Reading:

1. Pelczar, M.J. (2001) Microbiology. 5th edition, Tata McGraw-Hill Co, New Delhi.
2. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.
3. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V. Jackson R.B. (2008). Biology. Pearson Benjamin Cummings, USA. 8th edition.
4. Das, D. Handbook of Practical Microbiology, Cell Biology Genetics and Biometry. Academic Publishers.
5. Ananthanarayan, R. Kapil, A. A & P Textbook of Microbiology. 9th Edition.
6. Manna, M.K. (2005). Practical Physiology. 1st Edition. Sritara Prakasani.

MJCT-12: Human Nutrition and Dietetics

Course Code: S/PHY/504/MJC-12 **Course ID: 52514**

[Theory: Credits 3 (3 Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- This core course will enrich our students to develop their knowledge about health, nutrition, dietary pattern and nutrient deficiency disorders of community members.
- This course will fortify our students to learn about dietary requirements, calorie requirements and biological value of nutrients.
- They will get knowledge about physiological importance of micronutrients and nutraceuticals.
- The content will help to enlighten the importance of nutrition on sports performance and physiological homeostasis of aeronautics.

1. Introduction - Basic concept of nutrition and dietetics, concept of malnutrition, undernutrition and overnutrition.
2. Constituents of food - Macro and micro-nutrients and their significance.
3. Basal metabolic rate - Factors, determination by Benedict-Roth apparatus and significance.
4. Respiratory quotient and its significance.
5. Specific dynamic action - Definition, normal values of different food stuffs and its importance.
6. Calorific value of macronutrients.
7. Calorie requirements – In different types of work and adult consumption unit.
8. Dietary requirements of carbohydrate, protein, lipid and other nutrients at different phases of human life cycle, RDA as per ICMR 2020.
9. Nitrogen balance, essential amino acids, biological value of proteins, NPU, DC and PER.
10. Supplementary value of protein.
11. Dietary fibres – Source, types, composition and importance.
12. Resistance starch and its importance.
13. Vitamins and minerals (Fe, Na, K, Ca, P, I, Zn and selenium) – Sources, daily requirement, physiological role, deficiency symptoms and hypervitaminosis.
14. Principle of diet survey and its operation protocol.
15. Balanced diet and principles of formulation of balanced diet chart for growing child, college students, adult man and woman, pregnant woman and lactating woman.
16. Nutraceutical - Concepts and their importance.
17. Physiology of starvation and obesity.
18. Brief idea on sports and space nutrition.

MJCP-12: Human Nutrition and Dietetics Lab

Course Code: S/PHY/504/MJC-12 **Course ID: 52524**

[Practical: Credit 1/ (2 Practical Classes/Week) /Marks 15] 1 Credit

Course Learning Outcomes:

- This practical course will develop students' ability to collect nutritional data for the preparation of diet survey report.
- This practical course will enrich the students for transferring the knowledge from laboratory to community through preparation field survey report.

Diet Survey

Any one report (Hand-written) on the basis of diet survey or field survey from the following topics -

1. Diet survey report (Hand-written) of a family (As per ICMR specification): Each student has to submit a report on his/her locality/ costal area/ hilly area/ coal mines area.

Suggested Reading:

1. Srilakshmi, B. (2016). Nutrition Science. Fifth Edition. New Age International Publishers.
2. Srilakshmi, B. (2014). Dietetics. Seventh Edition. New Age International Publishers.
3. Das S. Textbook of Normal and Therapeutic Nutrition. Academic Publishers.
4. Das S. (2016). Textbook of Community Nutrition. 2nd Edition. Academic Publishers.
5. Basu, P. Nutritional Biochemistry. Academic Publishers.
6. Srilakshmi, B. (2015). Food Science. Sixth Edition. Age International Publishers.
7. Swaminathan, M. (2012). Handbook of Food and Nutrition. Jain Book Agency.
8. Swaminathan, M. (2012). Essentials of Food and Nutrition. Vol. I and Vol. II. Jain Book Agency.
9. Das, D. (2008). Biochemistry. Academic Publishers.
10. Satyanarayana, U and Chakrapani, U. (2021). Essential of Biochemistry. Elsevier.

MNT-5: Neuro-muscular Physiology

Course Code: S/PHY/505/MN-5 **Course ID: 52516**

[Theory: Credits 3(3 Lectures/Week)/ Marks 25] **3 Credits**

- Students will develop their knowledge on structure and function of muscle, nerve, synapse and neuromuscular junction.
- From this core paper they will learn the properties of muscle and nerve, and mechanism of muscle contraction.
- This core course will provide knowledge about receptors and their function.

Excitable Tissue: Nerve

1. Introduction
2. Structure and function of neuron.
3. Glial Cells - Types, structure and function.
4. Properties of nerve fibers, types and functions.
5. Origin and propagation of nerve impulse.
6. Nerve Fiber - Degeneration and regeneration.
7. Neurotrophins – Definition, chemical nature and function.

Excitable Tissue: Muscle

1. Introduction
2. Different types of muscle - Structure and properties. Functions of skeletal muscle, cardiac muscle and smooth muscle. Red and white muscle fibres.
3. Mechanism of skeletal muscle contraction. Isotonic, isometric, isokinetic contractions and muscle cramp.
4. Rigor mortis.

Synaptic and Neuromuscular Transmission

1. Synapses: Definition, types, EM structure and mechanism of synaptic transmission.
2. Myoneural junction - Structure, mechanism of impulse transmission.
3. Applied aspects – Myasthenia Gravis and Lambert-Eaton syndrome.

Receptor

1. Introduction
2. Receptors – Definition, bio-transducers, classification, functions and receptor potential.

MNP-5: Neuro-muscular Physiology Lab

Course Code: S/PHY/504/MN-3 **Course ID: 52526**

[Practical: Credit 1/ (2 Practical Classes/Week) /Marks 15] 1 Credit

Course Learning Outcomes:

- Student will learn the techniques for node of Ranvier and muscle fiber detection through staining.
- The contents will help to gain the ability of the students for the detection of nerve muscle coordination and signal propagation along with different components in this phenomenon.
- Student will gain the knowledge about the environmental hot and cold modulators on nerve-muscle activities.

1. Study of kymograph, induction coil, key and other instruments used to study mechanical responses of skeletal muscle.
2. Isolation and staining of node(s) of Ranvier ($AgNO_3$ method) and muscle fibers (Using methylene blue).
3. Preparation of gastrocnemius-sciatic nerve and muscle of toad.
4. Kymographic recording of simple muscle curve of toad.
5. Calculation of latent period, contraction period, relaxation period, maximum height of contraction from the kymographic recording of simple muscle curve of toad and interpret your result.
6. Kymographic recording of hot and cold saline on isolated nerve muscle preparation of toad from supplied curve.

Suggested Readings:

1. Mahapatra, A.B.S.M. (2014). Essentials of Medical Physiology. Forth Edition. Current Books International.
2. Sembulingam, K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.
3. Khurana, I. (2015). Medical Physiology. 2nd Edition. Elsevier India.
4. Chatterjee, C.C. (2016). Human Physiology Volume 1. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
5. Chaudhuri, S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.
6. Debnath J. (1998). Sharir Bigyan. Vol. I. Shreedhar Prokashani, Kolkata.
7. Note Books on Practical Human Experiment. Published by The Physiological Society of India. Kolkata.
8. Note Books on Practical Histology. Published by The Physiological Society of India. Kolkata.
9. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
10. Pal G.K. Pal, P. (2013). Textbook of Practical Physiology. Third Edition. Universities Press.
11. Manna, M.K. (2005). Practical Physiology. 1st Edition. Sritara Prakasani.

ACS/506/INT-3

INT-3: Internship

Period of programme:

- For an internship, one credit of Internship means two-hour engagement per week. Accordingly, in a semester of 15 weeks' duration, one credit in this course is equivalent to 30 hours of engagement in a semester.
- An internship of **60** hours duration after the 4th semester will be mandatory for the students enrolled in UG degree programmes.

Nature of Internship:

Students will be provided with opportunities for internships to actively engage with the practical side of their learning and, as a by-product, further improve their employability. There are indicative clusters identified at central, state, micro and local government/ administration levels and HEIs at their own level can identify and also go beyond these clusters for internships.

Internship Report: After completion of the Internship, the student shall prepare, with Activity logbook as a reference, a comprehensive report in consultation with the mentor to indicate what he/she has observed and learned in the training period along with the internship outcomes. The training report should be signed by the internship supervisor of the concerned college, authorised for the purpose, before the date of evaluation.

Evaluation:

- The parent HEI will examine/evaluate the student's performance following its evaluation method.
- At HEI, the intern will be evaluated through an internship report/seminar/viva voce on his/ her work, by a committee where an external examiner will be appointed by the University.
- The Head of the concerned Department and the concerned Supervisor will be the other members of the committee of the Viva-voce/seminar.

Evaluation of the report will be on the basis of following suggestive aspects:

I. Activity logbook and evaluation of Internship report duly signed by appropriate authority

II. Format of presentation and the quality of the intern's report

III. Acquisition of skill sets by the intern

IV. Originality and any innovative contribution

V. Practical applications relationships with basic theory and concepts taught,

VI. Certificate by the concerned workplace head/manager

Proposed distribution of 50 marks for Internship evaluation	
Relevance of the Internship	05
New methods /Techniques Learnt	10
Internship report (5-10 Pages) Covering certificate from internship execution authority, introduction, aim and objective, learning areas with process (Jiotag pictorials), application, discussion, summery	10
Presentation of Skill/ Seminar presentation (Covering the internship report)	10
Viva-voce on internship report	15
Total	**50 marks**

A. Pathological skill

Students will cover the observation, survey for fulfilling the points mentioned below

a. Solid and liquid waste product management of laboratory
b. Laboratory waste material disposal
c. Patient management and handling for sample collection upto report delivery in diagnostic centre by laboratory healthcare professionals.
d. Laboratory biosafety covering hygiene, sanitation, contamination and infection transmission checking using disinfectant, decontaminants, detergents etc. along with personal protection and interference from laboratory to community transmission.
e. Lab quality Control – Internal and external quality control for laboratory investigation in connection with valid, accurate and correct data collection.
f. Calibration/Standardization of modern instruments at regular intervals with cross checking.
g. Proper report delivery covering laboratory ethics, cooperation with patients, patients' party and confidentiality maintenance of laboratory investigation.

B. First aid skill

Students will cover the observation, survey for fulfilling the points mentioned below

a. Basic Life Support (BLS)
CPR (Cardiopulmonary Resuscitation), Air way obstruction, use of fire extinguisher
b. Handling Wounds
Bandaging Techniques; Bleeding Control; Burns
c. Fractures and Injuries
Fractures; Dislocations; sprains and Strains
d. Medical Emergencies
Heart Attack; Stroke; Diabetic Emergencies; Allergic Reactions; Seizures
e. Poisoning
Ingestion of Toxic Substances; Inhalation of Poisonous Fumes; Skin Exposure to Poisons; Carbon Monoxide Poisoning and snake bite.
f. Heat and Cold-Related Emergencies
Heat Exhaustion; Heat Stroke; Hypothermia; Frostbite.
g. Accidents and Injuries
Head, Neck, and Spinal Injuries; Eye Injuries; Bites and Stings.
h. Child and Infant First Aid
Choking in Children and Infants; Poisoning in Children; Childhood Injuries
i. Diarrhoea and dehydration
Home made ORS preparation, feeding of ORS, about ORS therapy to above patients, feeling of pulse rate and eye reflex.
j. First Aid in Emergency - Electrocution, Hanging and Drowning

C. Diet Management

Students will cover the observation, survey for fulfilling the points mentioned below

a. Principles of diet management in therapeutic condition:
b. Different types of diet: Clear fluid diet, fluid diet, semisolid diet, hospital diet.
c. Principle of diet management for diabetes /cardiovascular/ renal failure/ gastrointestinal disease
d. Diet for febrile conditions and surgical conditions.
e. Basic idea about nutrient requirement and supply in pathological conditions.
f. Idea on formulated diet preparation.

D. Guidelines for Meditation and Yoga

a. Microenvironment of Yoga centre and essential components of Yoga centre

b. Types of Yoga and Meditation- Basic guidelines for Yoga and Meditation

c. Yoga and Meditation for mental concentration and memory development – Its process and steps, precaution for proper execution.

d. Gastrointestinal health upgradation by Yoga and Meditation - Its process and steps, precaution for proper execution.

e. Yoga and Meditation for cardio-pulmonary health improvement - Major types, guidelines, seps and precautions.

f. Yoga and Meditation for neural disease recovery- Major types, guidelines, seps and precautions.

g. Pain and joint complication recovery by Yoga and Meditation – Relevant types of Yoga and Meditation for protocol, steps and precaution.

h. Yoga and Meditation for metabolic disease management.

SEMESTER–VI

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/PHY/ 601/MJC-13	MJCT-13: Endocrinology	3	10	25	50	3	NA	2
	MJCP-13: Endocrinology Lab	1		15				
S/PHY/ 602/MJC-14	MJCT-14: Reproductive Physiology and Embryology	3	10	25	50	3	NA	2
	MJCP-14: Reproductive Physiology and Embryology Lab	1		15				
S/PHY/ 603/MJC-15	MJCT-15: Excretory System and Body Temperature Regulation	3	10	25	50	3	NA	2
	MJCP-15: Excretory System and Body Temperature Regulation Lab	1		15				
S/PHY/ 604/MJC-16	MJCT-16: Biostatistics and Computer Application	3	10	25	50	3	NA	2
	MJCP-16: Biostatistics and Computer Application Lab	1		15				
S/PHY/ 605/MN-6	MNT-6: Digestion, Absorption and Metabolism	3	**10**	25	**50**	**3**	**NA**	**2**
	MNP-6: Digestion, Absorption and Metabolism Lab	1		**15**				
Total in Semester – VI		**20**	**50**	**240**	**250**	**15**		**10**
Third Year (UG Degree Course) Total Credit		**82+42**	**110**	**480**	**550**			

N.B. MJC – Major Core, MN – Minor; Theory: 1 Credit= 1 hour/Week, Practical: - 1 Credit= 2 hours/Week, Tutorial: - 1 Credit= 1 hour/Week* Degree in Physiology will be awarded to a student if he or she completes Internship of 2 credits in addition to total 124 credits in Semester I, II, III, IV, V & VI.

SEMESTER–VI

MJCT-13: Endocrinology

Course Code: S/PHY/601/MJC-13 **Course ID:62511**

[Theory: Credits 3 (3 Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- Content will help to upgrade the knowledge of the students with special emphasis on endocrine system as coordinating system.
- From this core course students will develop their knowledge about elementary idea on endocrine glands.
- Learner will gather specific knowledge on chemical nature, mode of action and Physiological functions of different hormones.
- They will also get information regarding pathophysiology of endocrine glands.

General concept on endocrinology

1. Introduction to endocrinology. Anatomy of endocrine system.
2. Hormones – Classification, hormone receptor- Fixed model and mobile model receptor. Genomic and non-genomic concept of regulation of hormone actions (c-AMP and tyrosine kinase). Positive and negative feedback mechanism.
3. Elementary idea of hormone action.
4. Hypothalamus: Basic concept of neurohormone. Hypothalamo-hypophyseal endocrine axis and portal system.

Pituitary gland

1. Introduction
2. Histology of pituitary gland.
3. Anterior pituitary and posterior pituitary hormones and their functions.
4. Growth hormone – Mechanism, function of GH and applied aspects.
5. Hyperfunction and hypofunction of pituitary in humans.

Thyroid gland

1. Introduction
2. Anatomic considerations of thyroid gland.
3. Biosynthesis and regulation of secretion of thyroid hormones.
4. Functions of thyroid hormones.

5. Primary and secondary hyper and hypo-thyrodism, LATS, Hashimoto disease, thyroiditis, goiter, thyroid storm and Grave's disease.

Parathyroid gland

1. Introduction
2. Histological structure of parathyroid gland. Parathyroid hormones
3. Calcium and phosphate metabolism.
4. Bone physiology.
5. Vitamin D and its biotransformation; role of vitamin D on calcium metabolism and bone health.
6. Vitamin D as a hormone.

Pancreas

1. Introduction
2. Histology of pancreas.
3. Structure, biosynthesis, mechanism of action, function and regulation of insulin secretion.
4. Glucagon - Biosynthesis and function.
5. Blood sugar homeostasis.
6. Other Islet cell hormones.
7. Hypoglycemia and diabetes mellitus.

Adrenal cortex and medulla

1 Introduction
2. Histology of adrenal gland.
3. Adrenal Cortex-Biosynthesis and functions of adrenocortical hormones.
4. Adrenal Medulla - Biosynthesis and function of medullary hormones.
5. Regulation of adrenal hormones.
6. Cushing syndrome, Addison's disease, Conn's syndrome and pheochromocytoma.

Endocrine functions of the kidneys, heart, thymus and pineal gland

1. Introduction
2. The renin-angiotensin system.
3. Erythropoietin.
4. The endocrine function of the heart: Atrial natriuretic peptide.
5. Thymus gland - Hormones and physiological functions.
6. Pineal gland-neuroendocrine gland and function of melatonin.
7. Human chronobiology, biological rhythms; basic concepts and implications.

MJCP-13: Endocrinology Lab

Course Code: S/PHY/601/MJC-13 **Course Id: 62521**

[Practical: Credits 1 (2 Practical Classes/Week) /Marks 15] 1 Credits

Course Learning Outcomes:

- Student will increase their ability to record the effect of oxytocin and adrenalin on uterine movement of rat.
- The learner will enhance their skill to determine obesity using anthropometric parameters.
- They will increase their skill on quantification of blood calcium and blood glucose levels.
- Student will be able to identify specific pathophysiological disorders of endocrine system.

1. Study of the effects of oxytocin on uterine contraction of albino rats.
2. Study of the effects of adrenaline on intestinal and uterine movements of albino rats
3. Growth chart of under 5 (ICMR protocol) and interpretation.
4. Measurement of obesity by anthropometric parameters: Height, weight, BMI, chest circumference, MUAC and waist-hip ratio.
5. Quantification of serum calcium by colorimetric method using calcon indicator.
6. Case study on the basis of endocrine pathophysiology using photograph provided through lottery.
7. Blood glucose determination by glucometer.

Suggested Readings:

1. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.
2. Kronenberg, H.M. Melmed, S. Polonsky, K.S. Larsen, P.R. (2009). Williams Textbook of Endocrinology. Eleventh Edition. Saunders.
3. Ganong, W.F. Review of Medical Physiology. Lange Medical Book. Prentice-Hall International.
4. Ghai, C.L. A Text Book of Practical Physiology. 8th Edition. Jaypee.
5. Hall J.E. (2016).Guyton & Hall Textbook of Medical Physiology. Second South Asia Edition.
6. Mahapatra, A.B.S. (2014). Essentials of Medical Physiology. Forth Edition. Current Books International.
7. Sembulingam, K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.
8. Khurana, I. (2015).Medical Physiology. 2nd Edition. Elsevier India.
9. Chatterjee, C.C. (2016). Human Physiology Volume 2. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
10. Chaudhuri, S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.
11. Mukherjee, K.L. (2004). Medical Laboratory Technology. Vol. I, Vol. II and Vol. III. Tata McGraw-Hill.
12. Hinkle, J.L. Kerry H. Cheever, K.H. (2013). Brunner & Suddarth's Handbook of Laboratory and Diagnostic Tests. 2nd Edition. LWW Publisher.
13. Godkar, P.B. Godkar. O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition.
14. Debnath, J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
15. Manna, M.K. (2005). Practical Physiology. 1st Edition. Sritara Prakasani.

MJCT-14: Reproductive Physiology and Embryology

Course Code: S/PHY/602/MJC-14 **Course ID: 62512**

[Theory: Credits 3 (3 Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- The students will develop their knowledge on human reproduction and its associated abnormalities.
- Learner will also be enriched with knowledge about population control and family plaining
- They will learn about basic concept of menstruation and its hormonal control along with abnormalities.
- From this course our learners will learn about embryo development, physiology of pregnancy, parturition and lactation.

1. Introduction on reproductive system.
2. Sex differentiation and development:
    a. Chromosomal sex.
    b. Embryology of the human reproductive system.
    c. Aberrant sexual differentiation.
    d. Puberty and its hormonal control.
    e. Precocious and delayed puberty.
    f. Menopause.
3. Pituitary gonadotropins and prolactin axis.
4. The male reproductive system:
    a. Primary and secondary sex organs and their functions.
    b. Structure of sperm, motility, acrosomal reaction, capacitation and viability of sperm.
    c. Gametogenesis, spermiation and ejaculation.
    d. Endocrine function of the testes.
    e. Control of testicular function.
    f. Abnormalities of testicular function.
5. The female reproductive system
    a. Primary and secondary sex organs and their functions.
    b. Oogenesis and ovulation.
    c. Menstrual cycle and its hormonal control.
    d. Estrous cycle.
    e. Endocrine function of ovary.
    f. Control of ovarian function.
    g. Abnormalities of ovarian function.
6. Fertilization, development of morula, blastula and gastrula.
7. Implantation
8. Basic idea on organogenesis with special emphasis on heart and urogenital systems.
9. Male and female infertility.
10. Placenta – Structure, hormones and function.
11. Pregnancy – Physiology of pregnancy, hormonal regulation, pregnancy test and ectopic pregnancy.
12. Parturition.
13. Development of mammary gland, lactation and regulation of milk secretion.

14. Population control- Family planning and contraceptive measurement.

MJCP-14: Reproductive Physiology and Embryology Lab

Course Code: S/PHY/602/MJCP-14 **Course ID: 62522**

[Practical: Credits 1 (2 Practical Classes/Week) /Marks 15] 1Credits

Course Learning Outcomes:

- The student will develop their skill to study of estrous cycle.
- Learner will increase their ability on staining and identification of reproductive tissues.
- They will be able to perform pregnancy test by immunological method.
- Student will also improve their skill for male fertility status assessment by performing semen analysis.

1. Study of estrous cycle.
2. HE staining and identification of testis, ovary and uterus of paraffin embedded tissue sections.
3. Pregnancy test from human urine sample by immunological method.
4. Semen analysis: Sperm count, sperm motility and sperm viability by eosin and nigrosine staining.

Suggested Readings

1. Chatterjee, C.C. (2016). Human Physiology Volume 2. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
2. Mahapatra, A.B.S. (2014). Essentials of Medical Physiology. Fourth Edition. Current Books International.
3. Sembulingam, K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.
4. Khurana, I. (2015). Medical Physiology. 2nd Edition. Elsevier India.
5. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.
6. Chaudhuri, S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.
7. Pal, G.K. Pal, P. (2013). Textbook of Practical Physiology. Third Edition. Universities.
8. Note Books on Practical Histology. Published by The Physiological Society of India. Kolkata.
9. Mukherjee, K.L. (2004). Medical Laboratory Technology. Vol. I, Vol. II and Vol. III. Tata McGraw-Hill.
10. Hinkle, J.L. Kerry H. Cheever, K.H. (2013). Brunner & Suddarth's Handbook of Laboratory and Diagnostic Tests. 2nd Edition. LWW Publisher.

11. Godkar, P.B. Godkar. O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition.

12. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
13. Manna, M.K. (2005). Practical Physiology. 1st Edition. Sritara Prakasani.
14. Veeramani R. Inderbir Singh's Human Embryology (2024). 14th Edition. Jaypee Brothers Medical Publishers Pvt.

MJCT-15: Excretory System and Body Temperature Regulation

Course Code: S/PHY/603/MJC-15 **Course ID: 62513**

[Theory: Credits 3 (3Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- From this course the learner will study on excretory system with special emphasis on electrolytes and water balance of the human body.
- They will also get information about non-excretory function of kidney.
- Student will be enriched with the knowledge about structure and function of skin with physiology of sweating.
- This course will help to gather knowledge about regulation body temperature and its associated abnormalities.

Excretion

1. Introduction of excretory system, its structure and its function.
2. JG apparatus: Structure and function.
3. Urine formation – Glomerular ultrafiltration, tubular reabsorption and tubular secretion.
4. Physical properties and composition of urine (normal and abnormal).
5. Role of renal buffers on acid base regulation of urine.
6. Regulation of Na^+ and H_2O balance by renal system.
7. Counter current system.
8. Renal circulation and its peculiarities.
9. Diuretics and diuresis.
10. Disorders of renal functions - Renal failure (Dialysis), renal stone, glomerulonephritis, nephrotic syndrome.
11. Urinary bladder: Structure, filling and emptying of urinary bladder (Micturition - Mechanism and reflex)
12. Renal function test: Inulin and urea clearance test, renal threshold values.
13. Non-excretory function of kidney.

Skin

1. Structure of skin and its functions.
2. Sweat glands - Types, structure and composition of sweat, mechanism of sweat formation, secretion and its regulation.
3. Sebaceous glands - Structure and functions.
4. Insensible perspiration in brief.

Body temperature

1. Physiological processes of thermoregulation, factor affecting thermogenesis and thermolysis, concept of thermokinetics, homeotherm, poikilotherm, hibernation and aestivation.
2. Regulation of body temperature in homeotherms – Role of endocrine and nervous system.
3. Pyrexia, hyperthermia and hypothermia.

MJCP-15: Excretory System and Body Temperature Regulation Lab

Course Code: SH/PHY/603/MJCP-15 **Course ID: 62523**

[Practical: Credits 1/ (2 Practical Classes/Week) /Marks 15] 1 Credit

Course Learning Outcomes:

- The learner will get their ability to perform routine examination of urine to identify abnormal constitutions.
- Student will grow their skill to perform microscopic examination of urine also to identify RBC, pus cell, cast etc.
- They will enhance their ability to identify the relation between exercise, heart rate and body temperature.

1. Testing of normal constituents of urine (Biochemical Test)
2. Identification of abnormal constituent of urine (Biochemical Test)
3. Microscopic observation of RBC, pus cell and cast in urine
4. Measurement of body temperature in graded exercise condition

Suggested Readings

15. Chatterjee, C.C. (2016). Human Physiology Volume 2. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
16. Mahapatra, A.B.S. (2014). Essentials of Medical Physiology. Fourth Edition. Current Books International.
17. Sembulingam, K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.
18. Khurana, I. (2015). Medical Physiology. 2nd Edition. Elsevier India.
19. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.
20. Ganong, W.F. Review of Medical Physiology. Lange Medical Book. Prentice-Hall International.
21. Chaudhuri, S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.
22. Pal, G.K. Pal, P. (2013). Textbook of Practical Physiology. Third Edition. Universities.
23. Note Books on Practical Biochemistry. Published by The Physiological Society of India. Kolkata.
24. Mukherjee, K.L. (2004). Medical Laboratory Technology. Vol. I, Vol. II and Vol. III. Tata McGraw-Hill.
25. Hinkle, J.L. Kerry H. Cheever, K.H. (2013). Brunner & Suddarth's Handbook of Laboratory and Diagnostic Tests. 2nd Edition. LWW Publisher.
26. Godkar, P.B. Godkar. O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition.
27. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
28. Manna, M.K. (2005). Practical Physiology. 1st Edition. Sritara Prakasani.

MJCT-16: Biostatistics and Computer Application

Course Code: S/PHY/604/MJC-16 **Course ID: 62514**

[Theory: Credits 3 (3 Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- The course will enable the students to develop their knowledge about principle and application of statistics in biology.
- This core course will enrich the students to learn about statistical sampling, frequency distribution and graphical representation of data.
- The course will enrich the skill of the students for statistical data analysis using computer.
- This core course will increase the capacity of the students for statistical toll applications for hypothesis testing, association correlation, and regression studies.
- The content will increase the ability of the students for using computer in different domains of Physiology

Concepts in Biostatistics

1. Scope of statistics – Principles of statistical analysis of biological data.
2. Basic concepts – Variable, parameter, statistics and sampling.
3. Classification of statistics (Brief idea of statistics of location, statistics of dispersion, statistics of co-relation and statistics of regression). Brief idea of parametric and non-parametric statistics.
4. Presentation of data - Frequency distribution, frequency polygon, histogram, bar diagram, pie diagram and scattergram.
5. Measurement of central tendency- Mean, median, mode in grouped and ungrouped data.
6. Computation of dispersion- Mean deviation, standard deviation, standard error of mean and variance.
7. Standard score.
8. Probability- General concept.
9. Normal distribution - Properties and assumption, skewness and kurtosis.
10. Student's t-distribution- Properties and assumption.
11. Testing of hypothesis - Null hypothesis, alternative hypothesis, errors of inference (Type-I and type-II), degrees of freedom, levels of significance, students' t-test (Single group paired observation study, individual matched grouped study) and z-score for significance of difference.
12. Non-Parametric - Chi-square test (Assumption and test for independence).
13. Correlation and regression.

Concepts in computer application

1. History of computer, basic components of computer and their importance.
2. Binary number, decimal number, octal number, including their interconversion, addition, subtraction, multiplication and division using binary number.
3. Basic concept of software and computer language.
4. Concept of MS word, Excel and Power point with basic application.
5. Concept of networking and website.
6. Application of computer in Physiology.

MJCP-16: Biostatistics and Computer Application Lab

Course Code: S/PHY/604/MJCP-4 **Course ID: 62524**

[Practical: Credits 1 (2Practical Classes/Week) /Marks 15] **1Credits**

Course Learning Outcomes:

- This practical course will enable students to calculate statistical data, collected from field study.
- This practical course will fortify the students to develop their skill for preparing survey report.

Field study report

Submission and power point presentation of a computerized typing report on the basis of field survey from any one of the followings topics by using basic statistical tools -

1. Physiological parameters (At least three parameters to be measured): Heart rate, blood pressure, breathing rate, PFI, blood hemoglobin content, differential count of WBC and visual acuity.
2. Anthropometric measurements (At least three parameters): Height, weight, BMI, BSA, Chest Circumference, head circumference, MUAC, hip circumference, skin fold thickness, Waist-Hip ratio and waist-thigh ratio.
3. Epidemiological studies - Cross sectional and vertical.

Suggested Reading:

1. Das, D. Das A. (2013). Statistics In Biology and Psychology. Sixth Edition. Academic Publishers.
2. Chad L. Cross Wayne W. Daniel. (2014). Biostatistics: Basic Concepts and Methodology for the Health Sciences. Wiley.
3. Rao, S. (2012). Introduction to Biostatistics and Research Methods. Fifth Edition.
4. Bhadra, K.A. (2012). Mahajan'S Methods in Biostatistics for Medical Students And Research Workers. Eight Edition.
5. Dhara, P. (2006). Computer in Biological Science Book. Academic Publishers.
6. Salaria, R.S. (2017). Computer Fundamentals. Khanna Book Publishing.

MNT-6: Digestion, Absorption and Metabolism

Course Code: S/PHY/605/MN-6 **Course ID: 62516**

[Theory: Credits 3(3 Lectures/Week)/ Marks 25] **3 Credits**

Course Learning Outcomes:

- From this core course students will gather knowledge about digestion and absorption of principle food stuff.
- They will develop their knowledge in carbohydrate, protein and fat metabolism and their integrated pathways.
- Student will develop the knowledge about basic components of food with their nutritional values.

Digestive system:

Digestion and absorption

1. Anatomy of alimentary system.
2. Mastication, deglutition, movements of the alimentary canal and significance.
3. Composition and functions of digestive juices and bile.
4. Digestion and absorption of carbohydrate, protein and lipid.

Metabolism

1. Metabolism of carbohydrate: Glycogenesis in brief, glycolysis, glycogenolysis, gluconeogenesis, TCA cycle, Cori cycle and their significances.
2. Metabolism of lipids: Beta oxidation of fatty acid, formation and fate of ketone bodies. Lipoprotein – Classification and functions.
3. Metabolism of proteins: Transamination, oxidative and non-oxidative deamination and formation of urea.
4. Integration of carbohydrate, lipids and protein metabolism in brief.

MNT-6: Digestion, Absorption and Metabolism Lab

Course Code: S/PHY/605/MNP-6 **Course ID: 62526**

[Practical: Credits 1 (2Practical Classes/Week) /Marks 15] 1 Credits

Course Learning Outcomes:

- This practical paper will help to increase the skill of students in qualitative and quantitative importance of physiologically important biomolecules.
- Student will develop their skill in the titration process with high level of accuracy

Qualitative experiments

1. Qualitative tests for the identification of physiologically important substances: Hydrochloric acid, lactic acid, glucose, fructose, lactose, sucrose, starch, albumin, gelatine, peptone, urea, acetone, glycerol and bile salts - Systematic analysis and confirmatory test.

Quantitative experiments

1. Quantitative estimation of glucose by Benedict's method - Percentage and total quantity.
2. Quantitative estimation of amino nitrogen (Sorensen's Formol titration method) - Percentage and total quantity.

Suggested readings

1. Srilakshmi, B. (2016). Nutrition Science. Fifth Edition. New Age International Publishers.
2. Srilakshmi, B. (2014). Dietetics. Seventh Edition. New Age International Publishers.
3. Das, S. Textbook of Normal and Therapeutic Nutrition. Academic Publishers.
4. Das S. (2016). Textbook of Community Nutrition. 2nd Edition. Academic Publishers.
5. Basu, P. Nutritional Biochemistry. Academic Publishers.
6. Srilakshmi, B. (2015). Food Science. Sixth Edition. Age International Publishers.
7. Swaminathan, M. (2012). Handbook of Food and Nutrition. Jain Book Agency.
8. Chatterjee, C.C. (2016). Human Physiology Volume 1. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
9. Mahapatra, A.B.S. (2014). Essentials of Medical Physiology. Fourth Edition. Current Books International. 10. Sembulingam, K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.

11. Khurana, I. (2015). Medical Physiology. 2nd Edition. Elsevier India. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.
12. Barrett, K. E. Barman, S.M., Boitano, S. Brooks, H.L. (2012). Ganong's Review of Medical Physiology. 24th Edition. Lange Medical Book. Prentice-Hall International.
13. Pal, G.K. Pal, P. (2013). Textbook of Practical Physiology. Third Edition. Universities.
14. Shepherd.G.M. Neurobiology. Oxford University Press.
15. Bandopadhyay A. Snatak Sarir Bidya (2018) (Based on CBCS Curriculum for Semester I & II). Calcutta Book House Pvt. Ltd.
16. Masanta, N and Das, T. (2019) Snatak Sarirbidya. (UG CBCS syllabus) Vol II. Santra PublicationPvt. Ltd. 17. Debnath, J. (1998). Sharir Bignan. Vol.I & II. Shreedhar Prokashani, Kolkata.
18. Debnath J. Byabaharik Sharir Bignan, Shreedhar Prokashani, Kolkata