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/120/2024 Date: 27/05/2024

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 for the purpose will be framed and finalized as per the guidelines of appropriate authority. As an important corollary to the process, the workshop through online mode 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 notice.

Date: 30th May, 2024.

Time: 1 PM onwards

Google Meet joining info

Video call link: https://meet.google.com/tog-scsj-sra

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

SYLLABUS

FOR

FOUR YEARS UNDERGRADUATE PROGRAMME

IN

PHYSIOLOGY

Curriculum and Credit Framework for Undergraduate Programmes (CCFUP) Based on NEP 2020

With effect from the Academic Session 2023-2024

BANKURA UNIVERSITY

BANKURA

WEST BENGAL

PIN 722 155

CONTENTS

1. Introduction

Curriculum Framework of Undergraduate programme in Physiology has been modified based on National Education Policy-2020. NEP-2020 has conceptualized the ideas for overall development of individuals and for making the Nation a self-reliant and global leader. In the same spirit, we at Department of Physiology under Bankura University have developed a curriculum framework encompass the goals of NEP 2020. To this end, we have focused on choice of subject/disciplines of study, creating academic pathways having constructive combinations of disciplines for study with multiple entry and exit points as well as giving emphasis on experiential learning for students by introducing multidisciplinary and skill enhancement courses and actual hands-on training in the recent and trending aspects of the area concern.

In accordance with the NEP 2020, the UGC has formulated a new student-centric "Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)" which will facilitate students to pursue their career path by choosing the subject/field of their interest. NEP, 2020 states that imaginative and flexible curricular structures will enable creative combinations of disciplines for study and would offer multiple entry and exit points and thus, remove the currently prevalent rigid boundaries.

To take this forward, NEP, 2020 promotes rigorous research-based specialization and opportunities for multidisciplinary work, including academia, government and interdisciplinary thinking at the under graduate level. It also points out that, "Higher education qualifications leading to a degree/diploma/certificate shall be described by the National Higher Education Qualification Framework (NHEQF) in terms of such learning outcomes." The undergraduate degree should be of either a three- or four-year duration, with multiple entry and exit options within this period, with appropriate certifications. For example, a certificate after completing one year in a discipline or field including vocational and professional areas; a diploma after two years of study; or a Bachelor's degree after a three-year programme. The 4-year multidisciplinary Bachelor's programme, however, shall be the preferred option since it allows the opportunity to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per the choices of the student".

4-year UG Degree (Honours with Research): Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research stream in the fourth year. They should do a research project or dissertation under the guidance of a faculty member of the College. The research project/dissertation will be in the major discipline. The students who secure 164 credits, including 12 credits from a research project/dissertation, are awarded UG Degree (Honours with Research).

Objectives

The guidelines of the proposed multiple entry and exit option will serve the following objectives:

- Remove rigid boundaries and facilitate new possibilities for learners.
- Curtail the dropout rate and improve GER.
- Offer creative combinations of disciplines of study that would enable multiple entry and exit points.
- Offer flexibility in curriculum and novel course options to students in addition to discipline specific specializations.
- Offer different designs of the Master's programme.
- Enable credit accumulation and transfer along with provision of evaluation and validation of non-formal and informal learning for the award of a degree and encourage lifelong learning.
- Facilitate encashing credits earned when the learner resumes his/her programmes of study.

1.1. Program Outcome (PO)

P.O.1: Students will be enriched about the knowledge covering the functional activities of different physiological systems operating in co-ordinated fashion from molecular and cellular levels to the system levels.

P.O.2: Participants of this course will be empowered by perceiving information about the impact of environmental biotic and abiotic factors for the maintenance of homeostasis of human body.

P.O.3: Learners will be skilled and expertise themselves for doing biophysical and biochemical analysis of human body samples for assessment of health status and dissemination of public health awareness package to the community.

P.O.4: Learners will be skilled and expertise themselves for doing different haematological techniques for analysis of human blood samples.

P.O.5: Student will be oriented for cognitive power upgradation and problem-solving activity in different biological deviated conditions in connection with acclimatization to real life situation.

P.O.6: Undergraduate students will themselves achieved integrated and interdependent knowledge among human body activities in collaborative manners with plant and animal kingdom in a holistic fashion.

P.O.7: Students will get idea about the different disease causing agents and their prevention; personal hygiene. They will also enrich about the knowledge of ideal nutrients and balanced diet.

P.O.8: Learners will skill themselves about the knowledge of different instruments like ECG, Chromatography, ELISA, RIA etc.

P.O.9: Statistical analysis and computer knowledge will help them better for future study and research work.

P.O.10: Biotechnological knowledge will help them advanced treatment for different genetic diseases, modern vaccination techniques etc.

1.2. Program Specific Outcome (PSO)

Course Objectives

Physiology provides a broad scientific education, which allows our graduates to pursue a career in research work or in related subjects and in areas such as Universities, Research Institute, and the Pharmaceutical Industry, scientific publishing or public health. As a graduate, the students will have a number of direct avenues –

P.S.O1: Will orient the students and attract them for pursuing higher studies in this line and for carrier building in the field of health sector, formal education sector, pharma industries, biotechnological corporates etc.

P.S.O2: Will facilitate the student for fundamental knowledge perception which will drive them to conduct further study in research in the field of allied health sciences, medical sciences, veterinary sciences and others.

P.S.O3: Will support the students for self-dependent learning and understanding to conduct experiments, knowledge bank enrichment and spreading the health awareness information through information-communication-technology.

P.S.O4: This course will provide a sound basis in human physiology to support further study in health and medical sciences or related fields. Development of practical knowledge and skills that is required for pursuing a career in clinical diagnosis, drug design, vaccine development, pharmaceutical industry.

P.S.O5: On working in different designing industry as an Ergonomist, in Defence Research Institute as Scientist and also at the Sports Training Institute as Sports Scientist/Physiologist.

2. Scheme for Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)

2.1 Course Structure with Credit Distribution

Programme and Course Structure with Credit Distribution: UG Degree Programmes with Single Major										
Category of Course (Credit)	Major (4)		Minor Stream (4)	Multidisciplinary (3)	Skill Enhancement Course (SEC) (3)	Ability Enhancement Course (AEC) (2)	Value Added Courses Common for all (4)	Summer Internship (2)	Research Project / Dissertation (12)	Total Credit / Number of Courses
Semester	DSC	DSE								
I	1× 4 =4		1× 4=4	1×3=3	1×3=3	1× 2=2	1× 4=4			20/6
II	1× 4 =4		1× 4=4	1×3=3	1×3=3	1× 2=2	1× 4=4			20/6
Certificate (Total Credit)	8		8	6	6	4	8	1×4=4* (ADDITIONAL)		40/12
III	2×4 =8		1× 4=4	1×3=3	1×3=3	1 × 2=2				20/6
IV	4×4 = 16		1×4=4			1 × 2=2				22/6
Diploma (Total Credit)	32		16	9	9	8	8	1×4=4* (ADDITIONAL)		82/24
V	4×4 =16		1×4=4					1×2 =2 Mandatory		22/6
VI	4×4 = 16		1×4=4							20/5
UG Degree (Total Credit)	64		24	9	9	8	8	2		124/35
VII	4×4 =16		1×4=4							20/5
VIII	4× 4 =16		1×4=4							20/5
UG HONS. (Total Credit)	24×4 =96		32	9	9	8	8	2		164/45
UG HONS. With Research (Total Credit)	21×4= 84		32	9	9	8	8	2	12**	

Certificate course in Physiology 1 year duration (I-II Semester); Diploma course in Physiology 2 years duration (I-IV Semester); UG Degree in Physiology 3 years of duration (I-VI); UG Degree in Physiology Honours 4 years of duration (I-VIII; without Research) and UG Degree in Physiology Honours 4 years of duration (I-VIII; with Research).

2.1a Credit Distribution Across Courses

Course Type	Total Papers	Credits
Major Core (MJC)	24	24×4 =96
Minor (MN)	8	8×4=32
Multidisciplinary (MD)	3	3×3=9
Skill Enhancement Courses (SEC)	3	3×3=9
Ability Enhancement Language Courses (AEC)	4	1×2=2 (ENG) 3×2=6 (MIL)
Value Added Course (VAC)	2	2×4=8
Internship (INT)	1	1×2=2
Research Project/Dissertation	1	1×12=12**
Totals	**46**	**164**

*Additional Summer Internship of 4 credit is mandatory for certificate and diploma courses.

2.2 Curriculum and Credit Framework for Course in Physiology

SEMESTER–I

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/PHY/ 101/MJC-1	MJCT-1: Cellular Basis of Physiology MJCP-1: Cellular Basis of Physiology Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 102/MN-1	MNT-1: Cellular Physiology MNP-1: Cellular Physiology Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 103/MD-1	MDT-1: Social Physiology	3	10	40	50	3	NA	NA
S/PHY/ 104/SEC-1	SECP-1: Cytology and Hematological Techniques Lab	3	10	40	50	NA	NA	6
ACS/105/ AEC-1	Compulsory English: Literature and Communication	2	10	40	50	2	NA	NA
ACS/106/ VAC-1	Environmental Studies	4	10	40	50	4	NA	NA
Total in Semester - I		**20**	**60**	**240**	**300**	**15**		**10**

N.B. MJC – Major Core, MN – Minor; MD – Multidisciplinary; SEC- Skill Enhancement Course; AEC- Ability Enhancement Course; VAC- Value Added Course.

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

SEMESTER–II

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/PHY/ 201/MJC-2	MJCT-2: Circulating Body Fluids MJCP-2: Circulating Body Fluids Lab	3 1	10	25 15	50	3	NA	2
S/PHY/202/ MN-2	MNT-2: Blood and Body Fluids MNP-2: Blood and Body Fluids Lab	3 1	10	25 15	50	3	NA	2
S/PHY/203/ MD-2	MDT-2: Environmental Physiology and Human Health	3	10	40	50	3	NA	NA
S/PHY/204/ SEC-2	SECT-1: Clinical Biochemistry	3	10	40	50	3	NA	NA
ACS/205/ AEC-2	MIL-1 (Santali/Sanskrit/Bengali)	2	10	40	50	2	NA	NA
ACS/206 /VAC-2	Any one of the following a. Health and Wellness b. Understanding India: Indian Philosophical Traditions and Value Systems c. Basics of Indian Constitution d. Arts and Crafts of Bengal e. Historical Tourism in West Bengal	4	10	40	50	4	NA	NA
ACS/207/ INT-1	Internship	4*		50	50	NA	NA	NA
Total in Semester - II		**20+4***	**60**	**240**	**300**	**18**		**04**
First Year (Certificate Course) Total Credit		**40+4***	**120**	**480**	**600**			

N.B. MJC –Major Core, MN – Minor; MD – Multidisciplinary; SEC- Skill Enhancement Course; AEC- Ability Enhancement Course; VAC- Value Added Course; INT- Internship; 4*- Additional

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

*** Certificate course in Physiology will be awarded to a student if he or she completes Internship of 4 credits in addition to total 40 credits in Semester I & II.**

SEMESTER–III

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/PHY/ 301/MJC-3	MJCT-3: Biophysics and Enzymes MJCP-3: Biophysics and Enzymes Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 302/MJC-4	MJCT-4: Chemistry of Biomolecules MJCP-4: Chemistry of Biomolecules Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 303/MN-3	MNT-3: Biophysics and Biochemistry MNP-3: Biophysics and Biochemistry Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 304/MD-3	MDT-3: Preventive and Social Medicine	3	10	40	50	3	NA	NA
S/PHY/305/ SEC-3	SECP-2: Food Adulteration and Nutritional Biochemistry Lab	3	10	40	50	NA	NA	6
ACS/306/ AEC-3	MIL-2	2	10	40	50	2	NA	NA
Total in Semester - III		**20**	**60**	**240**	**300**	**14**		**12**

N.B. MJC – Major Core; MN – Minor; MD – Multidisciplinary; AEC- Ability Enhancement Course; SEC- Skill Enhancement Course.

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

SEMESTER–IV

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/PHY/401 /MJC-5	MJCT-5: Nerve and Muscle Physiology	3	10	25	50	3	NA	2
	MJCP-5: Nerve and Muscle Physiology Lab	1		15				
S/PHY/402 /MJC-6	MJCT-6: Cardiovascular and Respiratory Physiology	3	10	25	50	3		2
	MJCP-6: Cardiovascular and Respiratory Physiology Lab	1		15				
S/PHY/403 /MJC-7	MJCT-7: Gastrointestinal Physiology	3	10	25	50	3	NA	2
	MJCP-7: Gastrointestinal Physiology Lab	1		15				
S/PHY/404 /MJC-8	MJCT-8: Energy Balance and Metabolism	3	10	25	50	3	NA	2
	MJCP-8: Energy Balance and Metabolism Lab	1		15				
S/PHY/ 405/MN-4	MNT-4: Cardio-respiratory Physiology	3	10	25	50	3	NA	2
	MNP-4: Cardio-respiratory Physiology Lab	1		15				
ACS/406/ AEC-4	English	2	10	40	50	2	NA	NA
ACS/407/ INT-2	Internship	4*		50	50	NA	NA	NA
Total in Semester - IV		**22+4***	**60**	**240**	**300**	**17**		**10**
Second Year (Diploma Course) Total Credit		**(40+42) +4***	**120**	**480**	**600**			

N.B. MJC – Major Core; MN – Minor; MD – Multidisciplinary; AEC- Ability Enhancement Course; INT- Internship; 4*- Additional

Theory: 1 Credit= 1 hour/Week, Practical: - 1 Credit= 2 hours/Week, Tutorial: - 1 Credit= 1 hour/Week. * Diploma in Physiology will be awarded to a student if he or she completes Internship of 4 credits at least 1 in 2 years in addition to total 82 credits in Semester I, II, III & IV.

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/PHY/ 506/INT-3	INT-3: Internship**	2	NA	50	50	NA	NA	7 days (6 Hr. per day)
Total in Semester – V		**22**	**60**	**240**	**300**	**15**		**10**

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

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

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–VII

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/PHY/ 701/MJC-17	MJCT-17: Ergonomics and Sports Physiology MJCP-17: Ergonomics and Sports Physiology Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 702/MJC-18	MJCT-18: Instrumentation MJCP-18: Instrumentation Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 703/MJC-19	MJCT-19: Genetics, Molecular Biology and Biotechnology MJCP-19: Genetics, Molecular Biology and Biotechnology Lab	3 1	10	25 15	50	3	NA	2
S/PHY/ 704/MJC-20	MJCT-20: Research Methodology and Research Ethics	4	10	40	50	4	NA	NA
S/PHY/ 705/MN-7	MNT-7: Microbiology and Immunology MNP-7: Microbiology and Immunology Lab	3 1	10	25 15	50	3	NA	2
Total in Semester – VII		**20**	**50**	**240**	**300**	**18**		**04**

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

SEMESTER–VIII

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/PHY/ 801/MJC-21	MJCT-21: Social Physiology MJCP-21: Social Physiology Lab	3 1	10	25 15	50	4	NA	2
S/PHY/ 802/MJC-22	MJCT-22: Nanobiotechnology	4	10	40	50	4	NA	NA
S/PHY/ 803/MJC-23	MJCT-23: Physiological Basis of Pharmacology and Toxicology MJCP-23: Physiological Basis of Pharmacology and Toxicology Lab	3 1	10	25 15	50	4	NA	2
S/PHY/ 804/MJC-24	MJCT-24: Environmental Physiology MJCP-24: Environmental Physiology Lab	3 1	10	25 15	50	4	NA	2
S/PHY/ 805/MN-8	MNT-8: Endocrine and Reproductive Physiology MNP-8: Endocrine and Reproductive Physiology Lab	3 1	**10**	25 **15**	**50**	**4**	**NA**	**4**
S/PHY/ 806/RPD-1	RESEARCH PROJECT Student secured more than 75%marks in last six semesters who opt for Honours with Research has one research project of 12 credits to complete under any of the faculty in lieu of 3 MJE papers	12	NA	150	150	NA	NA	NA
Total in Semester – VIII		**20**	**50**	**240**	**250**	**16***		**16**
Fourth Year UG Hons. With Research		**124+40 = 164**	**110**	**480**	**550**			

N.B. MJC – Major Core; MN – Minor; RPD- Research Project. Theory: - 1 Credit= 1 hour/Week, Practical: - 1 Credit= 2 hours/Week, Tutorial: - 1 Credit= 1 hour/Week

Honours in Physiology will be awarded to a student if he or she completes Internship (in Semester V) of 2 credits in addition to total 162 credits in all Semesters

Honours with Research in Physiology will be awarded to a student if he or she completes \Internship (in Semester V) of 2 credits in addition to total 162 credits in all Semesters provided He or She successfully completed Research Project in lieu of 3 DSE papers.

2.3 Choices for Major Core (MJC) Courses

SEMESTER	COURSE	CHOICE
I	MJC-1	MJCT-1: Cellular Basis of Physiology MJCP-1: Cellular Basis of Physiology Lab
II	MJC-2	MJCT-2: Circulating Body Fluids MJCP-2: Circulating Body Fluids Lab
III	MJC-3	MJCT-3: Biophysics and Enzymes MJCP-3: Biophysics and Enzymes Lab
	MJC-4	MJCT-4: Chemistry of Biomolecules MJCP-4: Chemistry of Biomolecules Lab
IV	MJC-5	MJCT-5: Nerve and Muscle Physiology MJCP-5: Nerve and Muscle Physiology Lab
	MJC-6	MJCT-6: Cardiovascular and Respiratory Physiology MJCP-6: Cardiovascular and Respiratory Physiology Lab
	MJC-7	MJCT-7: Gastrointestinal Physiology MJCP-7: Gastrointestinal Physiology Lab
	MJC-8	MJCT-8: Energy Balance and Metabolism MJCP-8: Energy Balance and Metabolism Lab
V	MJC-9	MJCT-9: Physiology of Nervous System MJCP-9: Physiology of Nervous System Lab
	MJC-10	MJCT-10: Special Senses MJCP-10: Special Senses Lab
	MJC-11	MJCT-11: Microbiology and Immunology MJCP-11: Microbiology and Immunology Lab
	MJC-12	MJCT-12: Human Nutrition and Dietetics MJCP-12: Human Nutrition and Dietetics Lab

VI	MJC-13	MJCT-13: Endocrinology MJCP-13: Endocrinology Lab
	MJC-14	MJCT-14: Reproductive Physiology and Embryology MJCP-14: Reproductive Physiology and Embryology Lab
	MJC-15	MJCT-15: Excretory System and Body Temperature Regulation MJCP-15: Excretory System and Body Temperature Regulation Lab
	MJC-16	MJCT-16: Biostatistics and Computer Application MJCP-16: Biostatistics and Computer Application Lab
VII	MJC-17	MJCT-17: Ergonomics and Sports Physiology MJCP-17: Ergonomics and Sports Physiology Lab
	MJC-18	MJCT-18: Instrumentation MJCP-18: Instrumentation Lab
	MJC-19	MJCT-19: Genetics, Molecular Biology and Biotechnology MJCP-19: Genetics, Molecular Biology and Biotechnology Lab
	MJC-20	MJCT-20: Research Methodology and Research Ethics
VIII	MJC-21	MJCT-21: Social Physiology MJCP-21: Social Physiology Lab
	MJC-22	MJCT-22: Nanobiotechnology
	MJC-23	MJCT-23: Physiological Basis of Pharmacology and Toxicology MJCP-23: Physiological Basis of Pharmacology and Toxicology Lab
	MJC-24	MJCT-24: Environmental Physiology MJCP-24: Environmental Physiology Lab

2.4 Choices for Minor (MN) Courses

SEMESTER	COURSE	CHOICE
I	MN-1	MNT-1: Cellular Physiology MNP-1: Cellular Physiology Lab
II	MN-2	MNT-2: Blood and Body Fluids MNP-2: Blood and Body Fluids Lab
III	MN-3	MNT-3: Biophysics and Biochemistry MNP-3: Biophysics and Biochemistry Lab
IV	MN-4	MNT-4: Cardio-respiratory Physiology MNP-4: Cardio-respiratory Physiology Lab
V	MN-5	MNT-5: Neuro-muscular Physiology MNP-5: Neuro-muscular Physiology Lab
VI	MN-6	MNT-6: Digestion, Absorption and Metabolism MNP-6: Digestion, Absorption and Metabolism Lab
VII	MN-7	MNT-7: Microbiology and Immunology MNP-7: Microbiology and Immunology Lab
VIII	MN-8	MNT-8: Endocrine and Reproductive Physiology MNP-8: Endocrine and Reproductive Physiology Lab

2.5 Choices for Multidisciplinary (MD) Courses

SEMESTER	COURSE	CHOICE
I	MD-1	MDT-1: Social Physiology
II	MD-2	MDT-2: Environmental Physiology and Human Health
III	MD-3	MDT-3: Preventive and Social Medicine

2.6 Choices for Skill Enhancement Courses (SEC)

SEMESTER	COURSE	CHOICE
I	SEC-1	SECP-1: Cytology and Hematological Techniques Lab
II	SEC-2	SECT-1: Clinical Biochemistry
III	SEC-3	SECP-2: Food Adulteration and Nutritional Biochemistry Lab

2.7 Question Pattern Across Courses

Question Pattern							
Examination	Course type	Credits (Theory + Practical)	Type of questions	Marks/ question	Number of questions to be attempted	Total	Number of options (Out of)
	Total Marks (Theoretical)					25	
	MJC, MI and MD	3	Objective	1	5	5	8
			Short	5	2	10	4
			Broad	10	1	10	2
	Total Marks (Theoretical)					40	
	SEC	3	Very short	2	5	10	8
			Short	5	4	20	6
			Broad	10	1	10	2
	Total Marks (Practical)					15	
	MJC, MI and MD	1	Practical Work	10	Answer all the question	10	NA
			Laboratory Note Book	3		3	NA
			Viva voce	2		2	NA
	Total Marks (Practical)					40	
	SEC	3	Practical Work	10	3	30	3
			Laboratory Note Book	5	NA	5	NA
			Viva voce	5	NA	5	NA

Duration of Examinations

Subject and Type of Papers	Full Marks	Duration
Honours (Theoretical)	25	1 Hour 15 Minutes
Honours (Theoretical)	40	2 Hours
Honours (Practical)	15	2 Hours
Honours (Practical)	40	4 Hours

3.0 Major Core (MJC) Courses

SEMESTER–I

3.1 MJCT-1: Cellular Basis of Physiology

Course Code: S/PHY/101/MJC-1 **Course ID: 12511**

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

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.

Unit 1

1. Introduction
2. Structure and function of cell organelle – Plasma membrane, nucleus, mitochondria, ribosome, lysosome, Golgi body, endoplasmic reticulum, peroxisomes, cytoskeletal elements and centrosomes.
3. Transport across cell membranes - Active, passive, carrier mediated, antiport and symport.
4. Intercellular communication – Gap junction, tight junction, intercalated disc, desmosomes and cell adhesion molecules. Extracellular matrix components.
5. Tissue, organ and systems – General classification, special emphasis on epithelial tissue and connective tissue. Brief idea on organs and systems.

Unit 2

1. Cell cycle – Definition, different phases of cell cycles, regulation and check points of cell cycle.
2. 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.
3. Apoptosis and necrosis - Basic concept and pathways involved.
4. Aging - Definition, theories of aging, factors affecting and management.

3.2 MJCP-1: Cellular Basis of Physiology Lab

Course Code: S/PHY/101/MJC-1 **Course ID: 12521**

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

Course Learning Outcomes:

- From this course students will gather their 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.

1. Principle, working procedure and function of different components of microscope.
2. Introduction on permanent slides - Applied value.
3. Study and identification of stained sections of different mammalian tissues and organs: Bone, trachea, lungs, spleen, lymph gland, tongue, esophagus, 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.
4. Examination and staining of fresh squamous epithelium by methylene blue stain.
5. Staining of adipose tissue using Sudan III or IV.

Suggested Readings:

1. Rastogy S. C. (2005). Cell and molecular biology. New Age International Publishers.
2. Mescher A.L. (2013). Junqueira's Basic Histology Text and Atlas. Thirteen Edition. The Tata McGraw Hill Companies.
3. Ross M.H and Reith E.J. (2011). Histology - A Text and Atlas. Sixth Edition. The Williams and Wilkins Company.
4. Bailey's Text Book of Histology, revised by W.M. Copenhaver; The Williams and Wilkins Company.
5. Eroschenko V.P. (2012). Difiore's Atlas of Histology: With Functional Correlations. Twelfth Edition. Lippincott Williams Wilkins Company.
6. Hardin J. Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education, Inc. USA. 8th edition.
7. Cooper G.M. and Hausman R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
8. Mahapatra A.B.S.M. (2014). Essentials of Medical Physiology. Forth Edition. Current Books International.
9. Sembulingam K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.
10. Khurana I. (2015). Medical Physiology. 2nd Edition. Elsevier India.
11. Chatterjee C.C. (2016). Human Physiology Volume 1. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
12. Chaudhuri S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.

13. Debnath J. (1998). Sharir Bigyan. Vol. I. Shreedhar Prokashani, Kolkata.
14. Note Books on Practical Biochemistry. Published by The Physiological Society of India. Kolkata.
15. Note Books on Practical Histology. Published by The Physiological Society of India. Kolkata.
16. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
17. Pal G.K. and Pal P. (2013). Textbook of Practical Physiology. Third Edition. Universities Press.
18. Halder H. Joardar N. Maiti R. Ghosh D. and Jana K. (2024). The Role of Reactive Oxygen Species in Health and Disease. In: The interplay between endoplasmic reticulum stress mediated ROS generation and Apoptosis in human diseases. Nova Publication. USA. https://doi.org/10.52305/TRSI2511

SEMESTER–II

3.3 MJCT-2: Circulating Body Fluids

Course Code: S/PHY/201/MJC-2 **Course ID: 22511**

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

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.

1. Introduction on circulating body fluids, body fluids compartments and significances.
2. Blood – Components, properties and general functions.
3. Plasma proteins - Origin, synthesis, classification and function.
4. Blood volume: Measurement and factors affecting blood volume.
5. Bone marrow – Types and functions.
6. Red blood cells – Morphology, Erythropoiesis and applied aspects.
7. Hemoglobin-Structure, types, synthesis and fate.
8. Brief idea on anaemia, polycythemia and hemoglobinopathies.
9. Brief idea on blood cell indices (MCV, MCH. MCHC and Colour index).
10. White blood cells – Morphology, classification, functions, leucopoiesis, applied aspects, Human leucocyte antigen (HLA) and Arneth index.
11. Platelets – Structure and thrombopoiesis.
12. Hemostasis – Definition, factors, modern concept and abnormalities in hemostasis and anticoagulants.
13. Blood group and Rh typing. Cross matching (Major and minor cross matching), blood transfusion and transfusion related hazards.
14. Lymph – Composition, formation, circulation and function.
15. Methods of separation of different components of blood in blood bank and their clinical importance.

3.4 MJCP-2: Circulating Body Fluids Lab

Course Code: S/PHY/201/MJC-2 **Course ID: 22521**

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

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.

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

Suggested Readings:

1. Mahapatra A.B.S.M. (2014). Essentials of Medical Physiology. Fourth 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. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.
7. 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.
8. Cyril, A. Keele, C. A. Neil, E, Joels, N. (2015). Samson Wrights Applied Physiology. 13th Edition, Oxford University Press. 2015.

9. Tripathi, Y. Tandon, O.P. (2011). Best & Taylor's Physiological Basis of Medical Practice. Thirteen Edition. Wolters Kluwer.
10. Jain, A. K. (2017). Textbook of Physiology. Vol I & II, Seventh Edition Avichal Publishing Company.
11. Mukherjee, K.L. (2004). Medical Laboratory Technology. Vol. I, Vol. II and Vol. III. Tata McGraw-Hill. 22. Hinkle, J.L. Kerry H. Cheever, K.H. (2013). Brunner & Suddarth's Handbook of Laboratory and Diagnostic Tests. 2nd Edition. LWW Publisher.
12. Godkar, P.B. Godkar, O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition
13. Debnath, J. (1998). Sharir Bigyan. Vol. I. Shreedhar Prokashani, Kolkata.
14. Note Books on Practical Histology. Published by The Physiological Society of India. Kolkata.
15. Varshney, Bedi, M. (2022). Ghai's A Textbook of Practical Physiology. Jaypee Brothers Med Pub Pvt Ltd
15. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
16. Pal G.K. Pal P. (2013). Textbook of Practical Physiology. Third Edition. Universities Press.

SEMESTER–III

3.5 MJCT-3- Biophysics and Enzymes

Course Code: S/PHY/ 301/MJC-3 **Course ID: 32511**

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

Unit 1

1. Study of Units for Measuring Concentration of Solutes: Normality, moles, equivalents, osmoles.
2. Acids and Bases: Acidosis, alkalosis, tolerance level of acidosis, alkalosis and normal homeostasis (in brief).
3. pH and Buffer – Henderson Hasselbalch equation (Quantitative problems) pH - Definition, explanation and significance. Buffer - definition, types; buffers in pH regulation.

Unit 2

1. Colloids - Definition, types, properties, importance, protective colloid and gold number.
2. Osmosis and Diffusion – Definition, physiological importance and osmotic pressure.
3. Surface Tension, Specific Gravity – Definition and biological application.
4. Viscosity and Resistance – Definition and physiological importance.
5. Volume pressure flow relationship – Poiseuille-Hagen formula, Law of Laplace, laminar and turbulent flow.
6. Dialysis and Ultracentrifugation – Definition, principle, mechanism in brief and biological application.

Unit 3

1. Autoradiography - Definition, principle and applied value.
2. Cell Fractionation and Tracer Techniques – Process and applied value.
3. Thermodynamics -1st Law, 2nd Law, entropy, enthalpy, Gibbs free energy - General concept and application in human body. Physiological steady state and living body as a thermodynamic system.
4. Gravity and acceleration – Effect of gravity, G forces, protection against positive G and negative G; zero gravity.

Unit 4

1. A study of Enzymes:
   a. Definition, apo-enzyme, holoenzyme, co-enzyme, properties and classification, isoenzymes, ribozymes and abzymes.
   b. Mechanism of enzyme action.
   c. Factors regulating enzyme activity.
   d. Kinetics – Hyperbolic and sigmoid kinetics; Michaelis constant and Kcat.
   e. Enzyme Inhibition-Competitive, non-competitive and uncompetitive.
   f. Allosteric modulation of enzymes activities.
   g. Concept of rate limiting enzymes – Definition and features.
   h. Basic concept of enzyme synthesis.
   i. Enzymes in clinical significance (amylase, acid and alkaline phosphatase, SGOT, SGPT, LDH and CPK).

3.6 MJCP-3: Biophysics and Enzymes Lab

Course Code: SH/PHY/ 301/ MJC-3 **Course ID: 32521**

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

1. Determination of systolic, diastolic, pulse and mean blood pressure by non-invasive method (Auscultatory Method).
2. Determination of enzyme activity (e.g., Amylase, GOT and GPT).
3. Preparation of buffer solution (Phosphate buffer and Bi-carbonate buffer)
4. Determination of pH of different fluids by pH meter.
5. Determination of strength of NaOH, HCl and H_2SO_4 by titration.

3.7 MJCT-4: Chemistry of Biomolecules

Course Code: S/PHY/ 302/MJC-4 **Course ID:32512**

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

A. Introduction on biomolecules and its importance on human system.

B. Carbohydrates

1. Definition.
2. Classification of carbohydrates and their sources.
3. Structure of carbohydrates and different types of glycosidic bonds.
4. Properties of carbohydrates: Physical, chemical and optical.
5. Functions of carbohydrates.
6. Resistance starch, dietary fibres.
7. Applied aspects of carbohydrates.

C. Proteins

1. Definition
2. Classification of proteins and their sources.
3. Different levels of protein structure - Primary, secondary (α-helix and β- pleated sheet), tertiary and quaternary. Forces stabilizing protein structures.
4. Bonds present in protein structure.
5. Properties of proteins.
6. Functions of proteins.
7. Amino acid - Classification and properties.
8. Applied aspects of proteins.

D. Lipids

1. Definition
2. Classification of lipids and their sources.
3. Classification of fatty acids.
4. Structure of lipids.
5. Properties of lipids.
6. Functions of lipids.
7. Lipoproteins and their classification.
8. Applied aspects of lipids.

E. Nucleic acids

1. Purine and pyrimidine: Structure, nomenclature and tautomerism.
2. Nucleic acids: Nucleosides and nucleotides - Structure.
3. Structure, types and function of DNA.
4. Structure, types and function of RNA.

3.8 MJCP-4: Chemistry of Biomolecules Lab

Course Code: S/PHY/ 302/MJP-4 **Course ID: 32522**

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

1. Introduction to the glass goods and preliminary devices used in biochemistry lab.
2. Safety profile followed in biochemistry lab.
3. Introduction of qualitative assessment of physiologically important biomolecules.
4. Qualitative tests for the identification of physiologically important substances:
   Hydrochloric acid, lactic acid, uric acid, glucose, galactose, fructose, sucrose, lactose, albumin, gelatin, peptone, starch, dextrin, urea, glycerol and bile salts - Systematic analysis and confirmatory test.

Suggested Readings

1. Das, D. (2004). Biophysics and Biophysical Chemistry. Fifth Edition. Academic Publishers.
2. Roy, R.N. (2015). A. Text Book of Biophysics. New Central Book Agency (P) Ltd.
3. Das, D. (2008). Biochemistry. Academic Publishers.
4. Note Books on Practical Biochemistry. Published by The Physiological Society of India. Kolkata.
5. Chadha, P.V. Handbook of Experimental Physiology and Biochemistry. Jaypee Brothers Medical Publishers.
6. Kenneley, P.J. Botham, K.M. McGuinness, O.P. Rodwell, V.W. Weil, P.A. (2023). Harper's Illustrated Biochemistry, Thirty-Second Edition. McGrawHill. Lange.
7. Satyanarayana, U and Chakrapani, U. (2021). Essential of Biochemistry. Elsevier.
8. Voet, D, Voet, J.G. (2011). Biochemistry. 4th Edition. CBS Publishers & Distributors-New Delhi.
9. Berg, J.M. Tymoczko, J.L. Gatto, G.J. Jr. Stryer, L. (2019). Biochemistry Ninth Edition. W.H. Freeman.
10. Nelson, D.L. Cox M. M. (2017). Lehninger Principles of Biochemistry. 7th Edition. W H Freeman & Co.
11. Alberts, B. Alexander, Johnson, A.D. Lewis, J. Morgan, D. Raff, M. Roberts, K. (2014). Molecular Biology of the Cell. W. W. 6th Edition. Norton & Company.

SEMESTER–IV

3.9 MJCT-5: Nerve and Muscle Physiology

Course Code: S/PHY/401/MJC-5 **Course ID: 42511**

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

Course Learning Outcomes:

- 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. Neuron – Types, structure and function.
3. Neuroglia - Types, structure and functions with special reference to myelinogenesis.
4. Nerve fiber – Types, functions and properties.
5. Stimuli, resting membrane potential, action potential, phases and ionic basis of action potential.
6. Propagation of nerve impulse in myelinated and nonmyelinated nerve fibres.
7. Degeneration and regeneration of nerve fiber.
8. Neurotrophins – Definition, chemical nature and function.
9. Receptors – Definition, classification and properties.
10. Ionic basis of origin of receptor potential in different types of receptors.

Junctional Transmission

1. Introduction
2. Neurotransmitter – Types and function.
3. Synapse – Types, EM structure and properties, mechanism of synaptic transmission, EPSP and IPSP.
4. EM structure of neuromuscular junction. Mechanism of neuromuscular transmission. EPP, MEPP, neuromuscular blocker (in brief).
5. Applied aspects – Myasthenia Gravis, Lambert-Eaton syndrome and denervation hypersensitivity in brief.

Excitable Tissue: Muscle

1. Introduction – Etiology of specific type of muscle, classification and general function.
2. Skeletal muscle
    a. Electron microscopic structure of muscle fibre and its classification.

b. Properties – Summation, tetanus, fatigue, chronaxie and rheobase.
c. Mechanism of contraction.
d. Function
e. Applied aspects of muscle - Muscle cramp and muscle flexibility.

3. Cardiac muscle
    a. Morphology – Structure and function.
    b. Properties of cardiac muscle.
4. Smooth muscle
    a. Morphology – Structure, properties and function.
    b. Single unit and multi-unit smooth muscle.
    c. Mechanism of contraction.
5. Comparative discussion between skeletal muscle, smooth muscle and cardiac muscle.

3.10 MJCP-5: Nerve and Muscle Physiology Lab

Course Code: S/PHY/401/MJC-5 Course ID: 42512

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

Course Learning Outcomes:

- This course gives a wide knowledge about different parts of kymograph, induction coil and their functions.
- From this course students will develop their skill on staining of nerve and muscle fibres for microscopic observation.
- Learner will increase their ability to prepare nerve muscle preparation and study about different mechanical events of muscle contraction.

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. Gastrocnemius-sciatic nerve and muscle preparation 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 with interpretation.
6. Kymographic recording of warm and cold saline on isolated nerve muscle preparation of toad.

3.11 MJCT-6: Cardiovascular and Respiratory Physiology

Course Code: S/PHY/402/MJC-6 **Course ID: 42513**

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

Cardiovascular System:

1. Anatomy of human heart and circulation through heart.
2. Special junctional tissues – Location, structure and function.
3. Origin and spread of cardiac impulse and pacemaker potential.
4. Properties of cardiac muscle.
5. Mechanical events of the cardiac cycle, volume & pressure change and heart sound,
6. Cardiac Output - Definition, types, factors affecting, regulation and measurement.
7. Anatomy, peculiarities and regulation of coronary circulation.
8. Regulation of heart rate, JVP.
9. Blood pressure, factors affecting and regulation.
10. ECG – Leads, Einthoven's triangle & law, normal waves, segments and intervals with significance, cardiac vector and mean electrical axis of heart.
11. Common cardiovascular diseases (Hypertension, myocardial ischaemia, stroke, mycocardial infarction, atherosclerosis and heart block) – Causes and Management.

Respiratory System:

1. Anatomy and function of respiratory system.
2. Non-respiratory functions of lungs.
3. Static and dynamic lung volumes and capacities.
4. Lung surfactant, lung compliance and dead space.
5. Breathing – Types, respiratory muscles and mechanism.
6. Respiratory membrane, gas exchange and ventilation perfusion ratio.
7. Pulmonary circulation.
8. Oxygen transport – Mechanism, oxygen dissociation curve.
9. Carbon dioxide transport – Mechanism, CO_2 dissociation curve.
10. Neural and chemical regulation of respiration.
11. Hypoxia, asphyxia, apnoea, cyanosis, acclimatization, mountain sickness, Cheyne-stroke breathing and Bitot's breathing.
12. Hyperbaric syndrome, oxygen therapy and SCUBA.
13. COPD and artificial respiration.
14. Pulmonary function test.

3.12 MJCP-6: Cardiovascular and Respiratory Physiology Lab

Course Code: S/PHY/402/MJC-6 **Course ID: 42523**

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

Animal Experiment:

1. Kymographic recording of the normal heart curve of toad.
2. Kymographic recording of effect of warm and cold saline on toad's heart

Human Experiment:

1. Lung function test by spirometer.
2. Pneumographic recording of chest movement: Effect of swallowing, hyperventilation, coughing, reading and laughing and breath holding.
3. Measurement of oxygen saturation by pulse oxymeter before and after exercise.
4. Measurement of resting respiratory rate and effect of posture on respiratory rate.
5. Measurement of resting heart rate and effect of posture on heart rate.
6. Measurement of resting blood pressure and effect of posture on heart rate.
7. Recording of ECG, calculation of HR, PR interval, duration of QRS complex from ECG graph.

3.13 MJCT-7: Gastrointestinal Physiology

Course Code: S/PHY/403/MJC-7 **Course ID: 42514**

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

Gastrointestinal structure

1. Introduction
2. Basic anatomy and histology of GI tract.
3. Digestive glands:
   a. Salivary gland – Histology, mechanism of salivary secretion, composition, function of saliva and applied aspects.
   b. Gastric gland – Histology; mechanism of secretion, composition, function of gastric juice, phases of gastric secretion and applied aspects with special emphasis on peptic ulcer.
   c. Liver – Histology, function, liver function test, fatty liver and liver cirrhosis.
   d. Biliary system – Synthesis, composition, function of bile, secretion and ejection of bile. Enterohepatic circulation. Gall stone, hepatitis and jaundice.
   e. Pancreas - Histology of exocrine portion; pancreatic juice – Composition, function mechanism of bicarbonate secretion, acute pancreatitis and cystic fibrosis.
   f. Intestinal glands – Secretion and function.
4. Gastrointestinal motility and function.
5. Gastrointestinal hormones.

Digestion and absorption

1. Introduction
2. Carbohydrates.
3. Proteins and nucleic acids.
4. Lipids.
5. Absorption of water and electrolytes.
6. Absorption of vitamins and minerals.

Normal microbial flora

General introduction of intestinal microbiota.

1. Brief ideas about prebiotics and probiotics and their clinical importance.

3.14 MJCP-7: Gastrointestinal Physiology Lab

Course Code: S/PHY/403/MJC-7 **Course ID 42524**

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

1. Introduction on Dale's apparatus and preparation of Dale's fluid**.**
2. Kymographic recording of normal movements of rat's intestine in Dale's apparatus.
3. Effects of anoxia, acetylcholine and adrenaline on normal intestinal movements of rat.

3.15 MJCT-8: Energy Balance and Metabolism

Course Code: S/PHY/404/MJC-7 Course ID: 42515

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

1. Introduction
2. Energy metabolism
3. Redox potential. Mitochondrial electron transport chain. Oxidative phosphorylation - Inhibitors and uncouplers.
4. Carbohydrate metabolism – Glycolysis, Krebs Cycle, glycogenesis, glycogenolysis, neoglucogenesis, HMP Shunt and Cori cycle and their regulations.
5. Protein metabolism – Deamination, transamination, ornithine cycle and protein synthesis.
6. Fat and cholesterol metabolism – Beta-oxidation, omega-oxidation, ketogenesis, fatty acid synthesis and cholesterol synthesis.
7. Integration of carbohydrate, fat and protein metabolism.
8. Purines and pyrimidines – Biosynthesis: de novo and salvage pathways.

3.16 MJCP-8: Energy Balance and Metabolism Lab

Course Code: S/PHY/404/MJC-8 Course ID: 42525

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

Biochemical Estimation

1. Introduction on colorimetric study.
2. Quantitative estimation of glucose, sucrose and lactose by Benedict's method - Percentage and total quantity.
3. Quantitative estimation of amino nitrogen (Sorensen's Formol titration method) - Percentage and total quantity.

Suggested Readings:

1. Carpenter, M.B. Core Text Book of Neuro-Anatomy. Nineth Edition. The Williams and Wilkins Company.
2. Charles Nobach. (2005). The Human Nervous System. 6th Edition. Mc Graw Hill Book Co.
3. Mahapatra A.B.S.M. (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. Chatterjee C.C. (2016). Human Physiology Volume 1& II. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
7. Chaudhuri S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.
8. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.

9. 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.
10. Cyril, A. Keele, C. A. Neil, E, Joels, N. (2015). Samson Wrights Applied Physiology. 13th Edition, Oxford University Press. 2015.
11. Tripathi, Y. Tandon, O.P. (2011). Best & Taylor's Physiological Basis of Medical Practice. Thirteen Edition. Wolters Kluwer.
12. Jain, A. K. (2017). Textbook of Physiology. Vol I & II, Seventh Edition Avichal Publishing Company.
13. Godkar, P.B. Godkar, O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition
14. Debnath, J. (1998). Sharir Bigyan. Vol. I. Shreedhar Prokashani, Kolkata.
15. Note Books on Practical Histology. Published by The Physiological Society of India. Kolkata.
16. Varshney, Bedi, M. (2022). Ghai's A Textbook of Practical Physiology. Jaypee Brothers Med Pub Pvt Ltd
17. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
18. Pal G.K. Pal P. (2013). Textbook of Practical Physiology. Third Edition. Universities Press.

4.0 Minor (MN) Courses

SEMESTER–I

4.1 MNT-1: Cellular Physiology

Course Code: S/PHY/102/MN-1 **Course ID: 12512**

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

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.

Unit 1

1. Introduction
2. Structure and function of cell organelle – Plasma membrane, nucleus, mitochondria, ribosome, lysosome, Golgi body, endoplasmic reticulum, peroxisomes, cytoskeletal elements and centrosomes.
3. Transport across cell membranes - Active, passive, carrier mediated, antiport and symport.
4. Intercellular communication – Gap junction, tight junction, intercalated disc, desmosomes and cell adhesion molecules. Extracellular matrix components.
5. Tissue, organ and systems – General classification, special emphasis on connective tissue and epithelial tissue. Brief idea on organs and systems.

Unit 2

1. Cell cycle – Definition, different phases of cell cycles, regulation and check points of cell cycle.
2. 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.
3. Apoptosis and Necrosis - Basic concept and pathways involved.
4. Aging: Definition, theories of aging, factors affecting and management.

4.2 MNP-1: Cellular Physiology Lab

Course Code: S/PHY/102/MN-1 **Course ID: 12522**

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

Course Learning Outcomes:

- From this course students will gather their 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.

1. Principle, working procedure and function of different components of microscope.
2. Introduction on permanent slides - Applied value.
3. Study and identification of stained sections of different mammalian tissues and organs: Bone, trachea, lungs, spleen, lymph gland, tongue, esophagus, 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.
4. Examination and staining of fresh squamous epithelium by methylene blue stain.
5. Staining of adipose tissue using Sudan III or IV.

Suggested Readings:

1. Rastogy S. C. (2005). Cell and molecular biology. New Age International Publishers.
2. Mescher A.L. (2013). Junqueira's Basic Histology Text and Atlas. Thirteen Edition. The Tata McGraw Hill Companies.
3. Ross M.H, and Reith E.J. (2011). Histology - A Text and Atlas. Sixth Edition. The Williams and Wilkins Company.
4. Bailey's Text Book of Histology, revised by W.M. Copenhaver; The Williams and Wilkins Company.
5. Eroschenko V.P. (2012). Difiore's Atlas of Histology: With Functional Correlations. Twelfth Edition. Lippincott Williams Wilkins Company.
6. Hardin, J. Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson Education, Inc. USA. 8th edition.
7. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
8. Mahapatra, A.B.S.M. (2014). Essentials of Medical Physiology. Forth Edition. Current Books International.
9. Sembulingam, K. and Sembulingam, P. (2016). Essentials of Medical Physiology 7th Edition. Jaypee.
10. Khurana, I. (2015).Medical Physiology. 2nd Edition. Elsevier India.
11. Chatterjee, C.C. (2016). Human Physiology Volume 1. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
12. Chaudhuri, S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.
13. Debnath J. (1998). Sharir Bigyan. Vol. I. Shreedhar Prokashani, Kolkata.
14. Note Books on Practical Biochemistry. Published by The Physiological Society of India. Kolkata.
15. Note Books on Practical Histology. Published by The Physiological Society of India. Kolkata.
16. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
17. Pal G.K. Pal, P. (2013). Textbook of Practical Physiology. Third Edition. Universities Press.

SEMESTER–II

4.3 MNT-2: Blood and Body Fluids

Course Code: S/PHY/202/MN-2 **Course ID: 22512**

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

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.

1. Introduction to blood and body fluids.
2. Blood – Components, properties and general functions.
3. Plasma proteins - Origin, synthesis, classification and function.
4. Blood volume: Measurement and factors affecting blood volume.
5. Bone marrow – Types and functions.
6. Red blood cells – Morphology, Erythropoiesis, fate of RBC and applied aspects.
7. Hemoglobin-Structure, types, synthesis and fate.
8. Brief idea on anaemia, polycythemia and hemoglobinopathies.
9. Brief idea on blood cell indices (MCV, MCH. MCHC and Colour index).
10. White blood cells – Morphology, classification, functions, leucopoiesis, applied aspects, Human leucocyte antigen (HLA) and Arneth index.
11. Platelets – Structure and thrombopoiesis
12. Hemostasis – Definition, factors, modern concept and abnormalities in hemostasis and anticoagulants.
13. Blood group and Rh typing. Cross matching (Major and minor cross matching), blood transfusion and transfusion related hazards.
14. Lymph – Composition, formation, circulation and function.
15. Methods of separation of different components of blood in blood bank and their clinical importance.

4.4 MNP-2: Blood and Body Fluids Lab

Course Code: S/PHY/202/MN-2 **Course ID: 22522**

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

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.

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

.

Suggestive Readings:

1. Chatterjee C.C. (2016). Human Physiology Volume 1. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
2. Hall J.E. (2016). Guyton & Hall Textbook of Medical Physiology. Second South Asia Edition
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. Chaudhuri S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.
7. Barrett K. E. Barman, S.M. Boitano, S. and Brooks, H.L. (2012). Ganong's Review of Medical Physiology. 24th Edition. Lange Medical Book. Prentice-Hall International.
7. Pal G.K. Pal P. (2013). Textbook of Practical Physiology. Third Edition. Universities.
8. Debnath J. Baboharik Sharir Bigyan. Shreedhar Prokashani, Kolkata.
10. Mukherjee K.L. (2004). Medical Laboratory Technology. Vol. I, Vol. II and Vol. III. Tata McGraw-Hill.
11. Godkar P.B. Godkar. O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition.

SEMESTER–III

4.5 MNT-3: Biophysics and Biochemistry

Course Code: S/PHY/ 303/MNT-3 **Course ID:32513**

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

Biophysics

1. Physiological importance of biophysical processes: Diffusion, osmosis, surface tension and absorption.
2. pH and Buffers: Brief idea and significance in human body.
3. Thermodynamics -1st Law and 2nd Law
4. Colloids: Definition, classification, properties and physiological importance.

Enzyme

1. Definition, classification and factors affecting enzyme action.
2. Michaelis Menten equation and hyperbolic kinetics of enzyme action in brief.
3. Concept of coenzymes, co-factors and isozymes.

Biochemistry

1. Carbohydrates: Definition, classification with examples, sources, fundamental properties and physiological importance.
2. Lipids: Definition, Sources, classification, properties, function and essential fatty acid. Lipoproteins and their functions.
3. Proteins: Definition, sources, classification, important properties and function, essential and non-essential amino acids. Amino acid pool.
4. Nucleic acids: Nucleoside, nucleotide, structure and types of DNA and RNA.

4.6 MNP-3: Biophysics and Biochemistry Lab

Course Code: S/PHY/ 303/MN-3 **Course ID:32523**

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

1. Introduction to the glass goods and preliminary devices used in biochemistry lab.
2. Safety profile followed in biochemistry lab.
3. Determination of strength of NaOH and HCl by titration against oxalic acid.
4. Qualitative tests for the identification of physiologically important substances: Hydrochloric acid, lactic acid, glucose, fructose, sucrose, lactose, starch, albumin, gelatin, peptone, urea, glycerol and bile salts - Systematic analysis and confirmatory test.

Suggested Readings

1. Das, D. (2004). Biophysics and Biophysical Chemistry. Fifth Edition. Academic Publishers.
2. Roy, R.N. (2015). A. Text Book of Biophysics. New Central Book Agency (P) Ltd.
3. Das, D. (2008). Biochemistry. Academic Publishers.
4. Note Books on Practical Biochemistry. Published by The Physiological Society of India. Kolkata.
5. Chadha, P.V. Handbook of Experimental Physiology and Biochemistry. Jaypee Brothers Medical Publishers.
6. Kenneley, P.J. Botham, K.M. McGuinness, O.P. Rodwell, V.W. Weil, P.A. (2023). Harper's Illustrated Biochemistry, Thirty-Second Edition. McGrawHill. Lange.
7. Satyanarayana, U and Chakrapani, U. (2021). Essential of Biochemistry. Elsevier.
8. Voet, D, Voet, J.G. (2011). Biochemistry. 4th Edition. CBS Publishers & Distributors-New Delhi.
9. Berg, J.M. Tymoczko, J.L. Gatto, G.J. Jr. Stryer, L. (2019). Biochemistry Ninth Edition. W.H. Freeman.
10. Nelson, D.L. Cox M. M. (2017). Lehninger Principles of Biochemistry. 7th Edition. W H Freeman & Co.
11. Alberts, B. Alexander, Johnson, A.D. Lewis, J. Morgan, D. Raff, M. Roberts, K. (2014). Molecular Biology of the Cell. W. W. 6th Edition. Norton & Company.

SEMESTER–IV

4.7 MNT- 4: Cardio-respiratory Physiology

Course Code: S/PHY/405/MN-4 **Course ID: 42516**

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

Cardiovascular System:

1. Anatomy of human heart and circulation through heart.
2. Special junctional tissues – Location, structure and function.
3. Origin and spread of cardiac impulse and pacemaker potential.
4. Properties of cardiac muscle.
5. Mechanical events of the cardiac cycle, volume & pressure change and heart sound.
6. Cardiac Output - Definition, types, factors affecting, regulation and measurement.
7. Anatomy, peculiarities and regulation of coronary circulation.
8. Regulation of heart rate.
9. Blood pressure, factors affecting and regulation.
10. ECG – Leads, Einthoven's triangle & law, normal waves, and significance.
11. Hypertension, myocardial ischaemia and stroke (in brief).

Respiratory System:

1. Functional anatomy of the respiratory system.
2. Mechanism of breathing.
3. Significance of physiological and anatomical dead space.
4. Lung volumes and capacities.
5. Lung surfactant, lung compliance
6. Transport of oxygen and carbon dioxide in blood and tissue.
7. Regulation of respiration: Neural and chemical.
8. Hypoxia, Caisson's disease, cyanosis, anoxia and acclimatization in brief.
9. COPD and Artificial respiration.

4.8 MNP-4: Cardio-respiratory Physiology Lab

Course Code: S/PHY/405/MN-4 Course ID: 42526

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

Animal Experiment:

1. Kymographic recording of the normal heart curve of toad.
2. Effect of temperature on kymographic recording of the heart curve of toad.

Human Experiment:

1. Pneumographic recording of chest movement: Effect of swallowing, hyperventilation, coughing, reading and laughing and breath holding.
2. Measurement of oxygen saturation by pulse oxymeter before and after exercise.
3. Measurement of resting respiratory rate.
4. Measurement of resting heart rate.
5. Measurement of resting blood pressure.

Suggested Readings

1. Mahapatra A.B.S.M. (2014). Essentials of Medical Physiology. Fourth 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& II. Eleventh Coloured Edition. CBS. Publishers and Distributers Pvt. Ltd.
5. Chaudhuri S.K. (2008). Concise Medical Physiology. Sixth Edition. NCBA.
6. Guyton, A.C. Hall, J.E. (2007) Text Book of Medical Physiology. Eleventh Edition. W.B. Saunders Co.
7. 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.
8. Cyril, A. Keele, C. A. Neil, E, Joels, N. (2015). Samson Wrights Applied Physiology. 13th Edition, Oxford University Press. 2015.
9. Jain, A. K. (2017). Textbook of Physiology. Vol I & II, Seventh Edition Avichal Publishing Company.
10. Godkar, P.B. Godkar, O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition
11. Debnath, J. (1998). Sharir Bigyan. Vol. I. Shreedhar Prokashani, Kolkata.
12. Note Books on Practical Histology. Published by The Physiological Society of India. Kolkata.
13. Varshney, Bedi, M. (2022). Ghai's A Textbook of Practical Physiology. Jaypee Brothers Med Pub Pvt Ltd
17. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
18. Pal G.K. Pal P. (2013). Textbook of Practical Physiology. Third Edition. Universities Press.

5.0 Multidisciplinary (MD) Courses

SEMESTER–I

5.1 MDT-1: Social Physiology

Course Code: S/PHY/103/MD-1 **Course ID: 12513**

[Theory: Credits 3 (3 Lectures/Week)/ Marks 40] **3 Credits**

Course Learning Outcomes:

- This course gives a wide knowledge about structural and functional organization of different body systems.
- 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.
- They acquire a concept about the importance of physical activity, exercise, yoga and meditation on health.

1. An introductory idea on different systems of human body.
2. Brief idea on structural and functional organization of different systems.
3. Basic concept of Social Physiology.
4. Role of nutrients and food on health management and disease prevention - cardiovascular disease (Hypertension, atherosclerosis and stroke), anaemia, diabetes mellitus, undernutrition, obesity and immunodeficiency disease.
5. Basic concept of physical activity, exercise and sports: Role of physical activity and exercise on human health and wellbeing.
6. Hygiene and sanitation for health maintenance and disease prevention.
7. Concept of health, food hygiene, food style and life style for disease prevention.
8. Preliminary idea about the impact of Yoga and Meditation on human health.

Suggested Readings:

1. Park K. (2023) Park's Textbook of Preventive and Social Medicine. 27th Edition. M/s. Banarsidas Bhanot "Press Chowk", 1167, Prem Nagar, Jabalpur – 482001, M.P., India.
2. Lal S. Pankaj A. (2023). Textbook of Community Medicine Preventive Social Medicine.7th Edition. CBS Publishers and Distributors Pvt. Ltd.
3. Bedi Y. (2022). Hand Book of Preventive and Social Medicine. 7th Edition. CBS Publishers and Distributors Pvt. Ltd.
4. Gupta, M.C. Mahajan, B.K. (2004). Textbook of Preventive and Social Medicine. 4th Edition. Jaypee.
5. Gupta P. Khan A.M. (2016). Textbook of Community Medicine: 1st Edition. CBS Publishers and Distributors Pvt. Ltd.
6. Saha S. Pathos of pandemic: COVID-19; New Delhi Publisher: ISSBN: 978-93-93878-00-7

SEMESTER–II

5.2 MDT-2: Environmental Physiology and Human Health

Course Code: S/PHY/203/MD-2 **Course ID: 22513**

[Theory: Credits 3/ (3 Lectures /Week)/ Marks 40] 3 Credits

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 soil pH in different climatic areas.

1. Basic concept of environment and its components.
2. Interrelationship of different components of an environment.
3. Pollutants: Definition and types.
4. Air pollution: Definition, sources, effects of air pollutant (SOX, NOX COX and particulate matter) on human health and control measurement in brief.
5. Water p ollution: D efinition, sources, water pollutants and health hazards, preventive measures, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), thermal pollution, concept of safe drinking water standards.
6. Pesticides, fungicides and herbicides and their effects on human health.
7. Heavy metals (arsenic, mercury and lead) and halide (fluoride) pollution and effects on human health.
8. Sound pollution: Definition, concept of noise, source of sound pollution, effects on human health, preventive measures of sound pollution, noise index and noise standards.
9. Soil pollution: Causes, effects of soil pollution on human and control of soil pollution, Solid waste managements, Bioremediation and Phytoremediation.
10. Radionuclide pollution: Ionizing radiations, effects of ionizing radiation on human health, permissible doses and controlling measure.

Suggested Readings:

1. Saha T.K. (2013). Ecology and Environmental Biology. Books and Allied Ltd.
2. Agarwal K.M. Sikdar P.K. Deb S.C. (2002). A text book of environment. Macmillan India Limited.
3. Pal G. (2006). Paribesh O dushan. Dasgupta Publisher.
4. Cunningham W.P. (2019) Principles of Environmental Science. Tata Mc GrewHill Publisher.
5. Miller G. T. Spoolman S. (2010) An introduction to environmental Science. 13th Edition. Brooks/Cole Publisher.

SEMESTER–III

5.3 MDT-3: Preventive and Social Medicine

Course Code: S/PHY/304/MD-3 **Course ID:32514**

[Theory: Credits 3/ (3 Lectures /Week)/ Marks 40] **3 Credit**

1. History of social medicine and community health. Dimensions and determinants of health. Concepts and indicators of health and wellbeing.
2. Globalization and its impact on health.
3. Health committees and development of health services in India.
4. Etiology, epidemiology and prevention of non - Communicable diseases - Cardio-vascular diseases (Hypertension, arthrosclerosis, angina pectoris and rheumatic heart disease), obesity, diabetes mellitus, cancers, blindness, mental health and occupational diseases.
5. Etiology, epidemiology and prevention of communicable diseases: Malaria, dengue, hepatitis and AIDS.
6. Basic idea of PCM and their prevention. Endemic goiter, rickets, osteomalacia, xeropthalmia, beriberi and their social implications.
7. Principles of formulation of diet chart of growing children, pregnant and lactating women.
8. Dietary management of obesity and diabetes mellites.
9. Population explosion – Principles and methods of family planning. Morbidity and mortality

Suggested Readings:

1. Park K. (2023) Park's Textbook of Preventive and Social Medicine. 27th Edition. M/s. Banarsidas Bhanot "Press Chowk", 1167, Prem Nagar, Jabalpur – 482001, M.P., India.
2. Lal S. Pankaj A. (2023). Textbook of Community Medicine Preventive Social Medicine.7th Edition. CBS Publishers and Distributors Pvt. Ltd.
3. Bedi Y. (2022). Hand Book of Preventive and Social Medicine. 7th Edition. CBS Publishers and Distributors Pvt. Ltd.
4. Gupta, M.C. Mahajan, B.K. (2004). Textbook of Preventive and Social Medicine. 4th Edition. Jaypee.
5. Gupta P. Khan A.M. (2016). Textbook of Community Medicine: 1st Edition. CBS Publishers and Distributors Pvt. Ltd.
6. Saha S. Pathos of Pandemic: COVID-19; New Delhi Publisher: ISSBN: 978-93-93878-00-7

6.0 Skill Enhancement Courses (SEC)

SEMESTER–I

6.1 SECP-1: Cytological and Hematological Techniques Lab

Course Code: S/PHY/104/SEC-1 **Course ID: 12525**

[Practical: Credits 3/ (6 Practical Classes/Week) /Marks 40] **3 Credits**

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.
- They acquire their skill for measurement of hemoglobin percentage and determination of haematocrit, MCV, MCH, MCHC, bleeding time and clotting time.
- Learner will fortify their skill on estimation of urea and creatinine in serum sample along with estimation of blood sugar level.

1. Preparation and staining of blood film with Leishman's stain and identification of blood cells.
2. Estimation of hemoglobin by Sahli's method.
3. Preparation of haemin crystal.
4. Cell viability study by eosin and nigrosine.
5. Staining of ciliated epithelial tissue by methylene blue.
6. Preparation and staining of skeletal muscle fiber by methylene blue.
7. Cell fragility test after exposure in different osmolar solution.
8. Identification of different phases of cell division from permanent slide.

Suggested Readings:

1. Note Books on Practical Histology. Published by The Physiological Society of India. Kolkata.
2. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
3. Pal G.K. Pal P. (2013). Textbook of Practical Physiology. Third Edition. Universities.
4. Manna M.K. (2005). Practical Physiology. 1st Edition. Sritara Prakasani.
5. Mukherjee K.L. (2004). Medical Laboratory Technology. Vol. I, Vol. II and Vol. III. Tata McGraw-Hill.
6. Hinkle, J.L. Kerry H. Cheever, K.H. (2013). Brunner & Suddarth's Handbook of Laboratory and Diagnostic Tests. 2nd Edition. LWW Publisher.
7. Godkar P.B. Godkar. O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition.

SEMESTER–II

6.2 SECT-1: Clinical Biochemistry

Course Code: S/PHY/204/SEC-2 **Course ID: 22515**

[Practical: Credits 3/ (3 Lectures/Week) /Marks 40] **3 Credits**

Course Learning Outcomes:

- Student will be developing their hands of 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.

1. Introduction to Clinical Biochemistry.
2. Principle, working procedure and application of colorimeter and spectrophotometer.
3. Pathophysiological significance of blood parameters – Glucose, serum protein, albumin, albumin globulin ratio, urea, creatinine, uric acid and ketone bodies.
4. Pathophysiological significance serum bilirubin and biliverdin.
5. Alteration of lipid profile and thyroid profile in human health and disease.
6. Pathological significance of some enzymes and proteins: Lactate dehydrogenase, glucose-6-phosphate dehydrogenase, creatine kinase, amylase, ACP, ALP, Beta-glucuronidase, ALT, AST, Lipase, Gamma-glutamyl transpeptidase, cardiac troponins and CRP.

Suggested Readings:

1. Basu P. Biochemistry Laboratory Manual. Academic Publishers.
2. Jayaraman, J. Laboratory Manual in Biochemistry. 2nd Edition. New Age International Publisher.
3. Das D. (2008). Biochemistry. Academic Publishers.
4. Satyanarayana, U. and Chakrapani. U. (2013). Biochemistry. 4th Edition. Elsevier India.
5. Nelson D.L and Cox M.M. (2017). Lehninger Principles of Biochemistry, 7th Edition., W.H. Freeman and Company.
6. Campbell M.K. (2012) Biochemistry, 7th ed., Published by Cengage Learning.
7. Chadha, P.V. Handbook of Experimental Physiology and Biochemistry. Jaypee Brothers Medical Publishers.
8. Kenneley, P.J. Botham, K.M. McGuinness, O.P. Rodwell, V.W. Weil, P.A. (2023). Harper's Illustrated Biochemistry, Thirty-Second Edition. McGrawHill. Lange.
9. Voet, D, Voet, J.G. (2011). Biochemistry. 4th Edition. CBS Publishers & Distributors-New Delhi.
10. Berg, J.M. Tymoczko, J.L. Gatto, G.J. Jr. Stryer, L. (2019). Biochemistry Ninth Edition. W.H. Freeman.

SEMESTER–III

SECP-1: Food Adulteration and Nutritional Biochemistry Lab

Course Code: S/PHY/305/SEC-3 **Course ID:32525**
[Practical: Credits 3/ (6 Practical Classes/Week) /Marks 40] 3 Credits

1. Qualitative assessment of food adulterants: Honey, fats, oils and spices (Turmeric and red chili powder).
2. Determination of artificial sweetening agents.
3. Determination of heavy metals (Lead and mercury) in foods.
4. Identification of microorganisms in food: Mould in bread, microbes in curd and bacteriological testing of milk.
5. Qualitative analysis for carbohydrate, protein and fat present in milk, potato, flour, rice and pulses.
6. Estimation of percentage of glucose present in food by Benedict method.
7. Demonstration about different food flavors.

Suggested Readings

1. Debnath J. Byabaharik Sharir Bignan. Shreedhar Prokashani, Kolkata.
2. Godkar, P.B. Godkar, O.D. (2014). Textbook of Medical Laboratory Technology. 14th Edition
3. Note Books on Practical Biochemistry. Published by The Physiological Society of India. Kolkata.
4. Varshney, Bedi, M. (2022). Ghai's A Textbook of Practical Physiology. Jaypee Brothers Med Pub Pvt Ltd.
5. Srilakshmi, B. (2015). Food Science. Sixth Edition. New Age International Publishers.