FACULTY OF PHYSIOTHERAPY
Master of Physiotherapy
Academic Year 2021-22

Subject Title:	BASIC SCIENCES
Subject Code:	1PT2010101
Year:	First Year MPT
Pre-requisite Subject	- NONE -

Objectives of course:

1. Analyze basic and complex motions, perform posture and gait analysis, identify and correlate normal movements and movement dysfunction.
2. Explain the biomechanical principles related to human movement
3. Assess movement dysfunction of various joints in upper extremity, lower extremity and spine, apply advance techniques /therapy to manage movement dysfunction.
4. Describe the physiology of different body systems while exercising.
5. Examine the role of heart and lung during exercise performance.
6. Compare /contrast between aerobic and anaerobic exercises
7. Describe and assess the effects of the environment on exercises.
8. Describe, Assess and analyze physiological response to acute and long term exercise in health and disease.
9. Apply basic concepts of research, design, problems & sampling techniques of research.
10. Describe types of study designs and apply basic concepts of statistics & principles of scientific enquiry in planning and evaluating the results.
11. Analyze various methods of quantitative and qualitative data analyses.
12. Describe the terminology in research, ethical issues and research process.
13. Apply sampling technique, research process, data collection, biostatics, correlation and statistical significance tests.
14. Use important sources, and explain steps in reviewing literature.
15. Describe the nature, meaning and principles of bioethics, concepts related to administration and management with professional ethics.
16. Apply ethical codes of physical therapy practice as well as moral and legal aspects related to human dignity and human rights.
17. Discuss the role of governing councils, constitutions and functions of W.H.O. and W.C.P.T and IAP.
18. Discuss role of management and administration, budget planning, leadership and teamwork, management skills in planning and implementing the administration in clinical practice.
19. Use information technology for documentation, record maintenance, data storage in professional practice.
20. Describe the benefit and harm of a patient's right & dignity in Health care settings.
21. Discuss role and concepts of teaching and learning.
22. Development of an individual's skill, knowledge, behaviors and attitude for PT services.

1a WORK & EXERCISE PHYSIOLOGY

Subject Contents (80 Hours)

1 Sources of Energy, Energy Transfer and Energy Expenditure at rest and various physical activities.

2 Nutrition, Body consumption, caloric balance, food for the athlete, regulation of food intake, ideal body weight, optional supply of Nutrients.

3 Metabolic consideration — VO2, Lactate threshold, RQ, energy expenditure in terms of calorimetry.

4 Acute effects of exercise on — Cardiovascular, Respiratory, Metabolic (aerobic & anaerobic), Thermo-regulatory, Buffer (pH), Neuro-musculoskeletal, Endocrine, Immune systems.

5 Conditioning effects (adaptations) of exercise on — Cardiovascular, Respiratory, Metabolic (Aerobic & anaerobic), Thermo regulatory, Buffer (pH), Neuro-Musculoskeletal (strength, power, endurance, speed, flexibility, agility, skill), Endocrine, Immune systems.

6 Body composition

7 Exercise at different altitudes.

8 Exercise at various climatic conditions.
9 Special aids to performance and conditioning.
10 Exercise prescription for health and fitness with special emphasis to cardiovascular disease, Obesity and Diabetes.
11 Principles of health promotion for Growing Children, Healthy Adults, Pregnant /Lactating females, Elderly, Sports person
12 Aerobic and Anaerobic Exercise Training
13 Fatigue assessment, Types, and Relevance with Exercise Tolerance tests & Training and management
14 Fitness Testing for:
   a. Aerobic power
   b. anaerobic power and capacity
   c. Muscular strength and power, flexibility.
15 Obesity –exercises for weight reduction
16 Exercise and aging
17 Clinical exercise physiology

1b. ELECTRO PHYSIOLOGY
Subject Contents (20 Hours)

1 Characteristics and components of Electro therapeutic stimulation systems and characteristic and components of Electro physiological assessment devices.

2 Electrical excitability of muscle and nerve and composition of peripheral nerves.
3 A. muscle plasticity in response to electrical stimulation.
B. Instrumentation for Neuromuscular electrical stimulation (NMES)
4 Neurobiology of afferent pain transmission and central nervous system mechanisms of pain modulation.

5 Electrical stimulation and circulation.
6 Clinical Electro physiological testing.
7 Bio-electricity(R.M.P-Action Potential)
8 Neuro transmitters. Synapse & Synaptic transmission.
9 Classification-muscle fibre, nerve fibre, motor unit.

10 Propagation of nerve impulse & physiology of muscle contraction.
11 Reflex-classification & properties.
12 Sensations-Pathways & classification.
13 Type of nerve injury & wallerian degeneration.

1c. BIOMECHANICS
Subject Contents (80 Hours)

Applied Anatomy

1. Anatomy of musculoskeletal system (Osteology, Myology, Arthrology)
2. Anatomy of Cardiopulmonary system (Structure of heart, Structure of lung, bronchopulmonary segments)
3. Anatomy of nervous system (Dermatomes and myotomes, cerebrum and cerebral hemispheres, cerebral cortex, cerebellum and its connections, brain stem midbrain, Pons, medulla)
4. Structure of kidney and bladder
5. Anatomy of Reproductive system

Kinesiology

1 **Kinematics:**
- a. Types of motion (accessory and joint play of axial and peripheral skeletal)
- b. Location of motion (instantaneous axis of movement, shifting axis of movement)
- c. Magnitude of motion (factors determining it)
- d. Direction of motion
- e. Angular motion and its various parameters
- f. Linear motion and its various parameters
- g. Projectile motions

2 **Kinetics:**
- a. Definition of forces
- b. Force vectors (composition, resolution, magnitude)
- c. Naming of Force (gravity and anti-gravity force, JRF)
- d. Force of gravity and COG
- e. Stability
- f. Reaction forces
- g. Equilibrium & Balance
- h. Linear forces system
- i. Friction and its various parameters
- j. Parallel force systems
- k. Concurrent force systems
- l. Work power and energy
- m. Moment arms of force & its application
- n. Force components
- o. Equilibrium of force

3 **Mechanical energy, work and power**
- a. Definition
- b. Positive and Negative work of muscles
- c. Muscle mechanical power
- d. Causes of inefficient movement
- e. Co-contractions
- f. Isometric contraction against gravity jerky movement
- g. Energy generation at one joint and absorption at another
- h. Energy flow and Energy system used by the body
- i. Energy storage

Biomechanics for different aspects

1 Biomechanics of: Bone and soft tissues, including muscles, ligaments, tendon and nerves.

2 Biomechanics of Joints: Classification, structure and function including kinematics and kinetics of joints.
3 Spine: Structure and function including kinematics and kinetics of Various Vertebral joints.
4 Changes in physical and mechanical properties because of aging, exercise, Immobilization and position
5 Mechanoreceptors: its types, distribution with respect to joint, structure and function and Clinical applications
6 (a) Gait:
a. Normal Gait and its determinants
b. Gait parameter including temporal and spatial
c. Kinematic and Kinetic of normal human gait
d. Pathological gait
e. Running
f. Stair climbing
(b) Gait Analysis.
a. Overview of normal gait analysis : kinetic and kinematic analysis; Description of some of the most commonly used types of observational gait analysis; Advantages and disadvantages of kinematic qualitative and kinematic quantitative gait analyses.
b. Gait Training, Pre ambulation programme, assistive devices and gait patterns, Recent advances in analysis of Gait
7 Posture Control, Optimal Posture and their deviations in different planes.
8 Ergonomics and its application in working environments

1d. RESEARCH METHODOLOGY & BIOSTATISTICS
Subject Contents (70 Hours)

RESEARCH METHODOLOGY

1 Research in Physiotherapy
a. Introduction
b. Research for Physiotherapist: Why? How? And When?
c. Research – Definition, concept, purpose, approaches
d. Internet sites for Physiotherapist
2 Research Fundamentals
a. Types of variables
b. Reliability & Validity
c. Drawing Tables, graphs, master chart etc
3 Writing a Research Proposal
a. Defining a problem
b. Hypothesis: function of hypothesis in quantitative research
c. Types of hypothesis, characteristics of testable hypothesis, wording of the hypothesis
d. Review of Literature
e. Formulating a question, Operational Definition
f. Inclusion & Exclusion criteria
g. Forming groups
h. Data collection & analysis
i. Results, Interpretation, conclusion, discussion
j. Informed Consent
k. Limitations

4 Research Design
a. Qualitative and Quantitative research designs
- Difference between qualitative and quantitative designs
b. Experimental design
Quasi experimental research; advantages and disadvantages of quasi experiments
Non experimental design
- Controlled trials
- Parallel or concurrent controls
- Randomized
- Non randomized
- Sequential controls
- Self controlled
- Crossover
- External controls
- Studies with no controls
c. Observational Study design
- Descriptive or case series
- Case control studies (retrospective)
- Cross sectional studies, surveys
- Cohort studies (prospective)
-Historical Cohort studies
d. Meta analyses

5 Population and sample
a. Definition of population and sample
b. Types of sampling
c. Sample size determination and calculation
d. Sample rationale
e. Non-probability sampling ; convenience sampling , quota sampling, purposive sampling, advantages and disadvantages of non probability sampling
f. Probability sampling; Simple random sampling, stratified random sampling,
g. Cluster sampling, systematic sampling, advantages and disadvantages of probability sampling

6 Data collection methods
a. scales and techniques of psychological measures
b. Research reliability, validity and criteria for assessing, measuring the tools
c. Presentation of data
d. Analysis and interpretation of research data
e. Role of computers
f. Pilot study

7 Interpretation of statistical results
a. Interpreting significant and non significant results
b. Discussion and conclusion of obtained results
c. Guidelines to interpret and critique research results

8 Writing research for publication
a. Guidelines to publish a research paper and its contents

9 Presenting a research report
a. Writing the report
b. Documentation
c. Details of the study
d. Arrangement of report
e. Practice - Presentation of study for discussion
f. Method of teaching - lecture and discussion- Seminars and practices.

10 Research Ethics
a. Importance of Ethics in Research, Ethical issues in human subjects research, Ethical principles that govern research with human subjects
b. Components of an ethically valid informed consent for research
11 Plagiarism

RESEARCH METHODOLOGY AND BIOSTATISTICS

1 Biostatistics
a. Introduction
b. Definition
c. Types
d. Application in Physiotherapy
2 Data
a. Definition
b. Types
c. Presentation
d. Collection methods
e. Various types of graphs, obtaining graphs using statistical software like excel
3 Measures of central value
a. Arithmetic mean, median, mode, Relationship between them
b. Partitioned values- Quartiles, Deciles, Percentiles
c. Graphical determination
4 Measures of Dispersion
a. Range
b. Mean Deviation
c. Standard Deviation
5 Normal Distribution Curve
a. Properties of normal distribution
b. Standard normal distribution
c. Transformation of normal random variables.
d. Inverse transformation
e. Normal approximation of Binomial distribution.
6 Correlation analysis
a. Bivariate distribution
b. Scatter Diagram
c. Coefficient of correlation
d. Calculation & interpretation of correlation coefficient
e. T-test, Z-test, P-value
7 Regression analysis
a. Lines of regression
b. Calculation of Regression coefficient
8 Sampling
a. Methods of Sampling
b. Sampling distribution
c. Standard error
d. Types I & II error

9 Probability (in Brief)
a. Probability and sampling
b. Probability as a mathematical system
c. Population and samples
d. Sampling distribution
e. Sampling methods
f. Point and interval estimation for proportion mean
g. Hypothesis testing, simple test of significance
h. Inferential technique: normal

10 Hypothesis Testing
a. Null Hypothesis
b. Alternative hypothesis
c. Acceptance & rejection of null Hypothesis
d. Level of significance

11 Parametric & Non parametric tests
a. Chi square test
b. Mann-Whitney U test
c. Wilcoxon Signed test
d. Kruskal-Wallis test
e. Friedman test
f. T-test/student T test g. Analysis of variance
h. Standard errors of differences

12 Learn SPSS software application and Graph Software application. [Not for Exam].

1e. EDUCATION TECHNOLOGY
Subject Contents (50 Hours)

1 Education:
a. Educational aims,
b. Agencies of education,
c. Formal and informal education,
d. Major philosophies of education (naturalism, idealism, pragmatism, realism) including Gandhi and Tagore. Modern and contemporary philosophies of education (Existentialism, Progressivism, Reconstructionism, Perennialism).
f. Philosophies of education in India – past, present and future. Role of educational philosophy, Current issues and trends in education.

2 Concepts of teaching and learning:
a. Theories of teaching,
b. Relationship between Teaching and Learning,
c. Psychology of Education,
d. Dynamics of behavior,
e. Motivational process of learning,
f. Perception,
g. Individual differences,
h. Intelligence personality.

3 Curriculum:
a. Curriculum committee,
b. Developments of a curriculum for P.T.,
c. Types of curriculum,
d. Formation of philosophy,
e. Courses objectives.
f. Course placements,
g. Time allotment.
h. Selection and organization of learning experience master plans of courses.
i. Master rotational plan – individual rotational plan,
j. Correlation of theory and practice,
k. Hospital and community areas for clinical instruction,
l. Clinical assignments,
m. Current trends and curriculum planning.

4 Principles and methods of teaching:
a. Strategies of teaching,
b. Planning of teaching,
c. Organization, writing lesson plan,
d. Audio visual aids,
e. Teaching methods – Socialized teaching methods.

5 Measurement and evaluation:
a. Nature of measurement of education, meaning, process, personal, Standardized,
b. Non-standardized tests.
c. Steps of constructing a test,
d. Measurement of cognitive domain,
e. Assessment techniques of affective and psychomotor domains,
f. Administering scanning and reporting.
g. Standardized tools,
h. Important tests of intelligence,
i. Attitude, instrument, personality,
j. Achievement and status scale.
k. Programme evaluation Cumulative evaluation.

6 Guidance and counseling :
a. Philosophy,
b. Principles and concepts,
c.Guidance and counseling,
d. Services of student and faculty.
e. Faculty development and development of personnel for P.T. services

1f. ETHICS AND ADMINISTRATION; PHYSIOTHERAPY EDUCATION AND PRACTICE

Subject Contents (50 Hours)

1 Concept of Morality, Ethics and Legality.

2 Rules of Professional conduct, Medico Legal and Moral Implications.

3 Communication skills, Client interest and Satisfaction.

4 Interdisciplinary Relation, Co-partnership, Mutual Respect, Confidence and Communication, Responsibilities of the Physiotherapists, Status of Physiotherapist in Health Care.

5 Role of Professional in Socio Personal and Socio Economical context.

6 Need of Council Act for regulation of Professional Practice.

7 Self- Regulatory role of Professional Association.
8 Rules of Professional Conduct.
9 Role of WCPT, Various branches and special interest group of WCPT.
10 Indian association of physiotherapists: rules, regulations, framework, aims, and objectives. Physiotherapy and law. Medico legal aspects of physiotherapy, liability, negligence, malpractice, licensure, workman's compensation.
11 Administration & Marketing – personnel Policies –Communication & Contract. Administration principles based on Goal & Function at large Hospital / Domiciliary set up / Private Clinic / Academic Institution.
12 Methods of maintaining records – Budget planning
13 Performance analysis – Physical structure, reporting system, Man P Status, Functions, Quality & Quantity of Services, Turnover – Cost benefit, Contribution.
14 Aims of physiotherapy education
15 Concepts of teaching and learning; Theories of teaching.
16 Principles and methods of teaching;
a. Strategies of teaching
b. Planning of teaching
c. Organization
d. Writing lesson plans
e. Audio visual aids
f. Teaching methods
17 Guidance and counseling; principles and concepts, guidance and counseling services of students and faculty
18 Practical
a. Design a curriculum for a basic physiotherapy programme
b. Prepare a lesson plan and conduct classes
c. Construct a written objective type test for the lessons you have taken
d. Prepare a plan for evaluating students
e. Internal assessment tests in all topics
f. Lectures and seminars.
19 Hospital as an organization - Functions and types of hospitals
20 Roles of Physical therapist, Physical therapy Director, Physiotherapy Supervisor, Physiotherapy assistant, Physiotherapy aide.
21 Confidentially of the Patient's status
22 Legal responsibility
23 Consumer protection law, health law, MCI.
24 Standards of practice for physiotherapists
25 Liability and obligations in the case of medical legal action
26 Law of disability & discrimination