INSTITUTE	**FACULTY OF PHYSIOTHERAPY**
PROGRAM	**MASTER OF PHYSIOTHERAPY**
YEAR	**1**
COURSE TITLE	**BASIC SCIENCE**
COURSE CODE	**17MP0101**
COURSE CREDITS	**16**

Objective:

1. To Understand the skeletal and neuro-muscular system considered for movement.
2. To explain the biomechanical principles and pathomechanics concerning the human movement and relate to the concept of pathomechanics in Various conditions.
3. To Apply the knowledge of ergonomics to effectively communicate, educate workers regarding poor ergonomics
4. To demonstrate knowledge of ethical and medico-legal consideration towards patients
5. To Understand exercise physiology in healthy and diseased population and body composition measurement, exercise and related symptoms testing in healthy and pathological conditions
6. To Understand exercise prescription for healthy and various common diseased population and types of diet for various population

Course Outcomes: After completion of this course, student will be able to:

1. Understand the skeletal and neuro-muscular system considered for movement.
2. Explain the biomechanical principles and pathomechanics concerning the human movement and relate to the concept of pathomechanics in Various conditions.
3. Apply the knowledge of ergonomics to effectively communicate, educate workers regarding poor ergonomics
4. Demonstrate knowledge of ethical and medico-legal consideration towards patients
5. Understand exercise physiology in healthy and diseased population and body composition measurement, exercise and related symptoms testing in healthy and pathological conditions
6. Understand exercise prescription for healthy and various common diseased population and types of diet for various population

Pre-requisite of course: To have basic knowledge about anatomy, physiology, biomechanics of the body

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
8	0	0	50	30	20	0	0

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Contents : Unit	Topics	Contact Hours
1	**Work and Exercise Physiology** Sources of Energy, Energy Transfer and Energy Expenditure at rest and various physical activities. , Nutrition, Body consumption, caloric balance, food for the athlete, regulation of food intake, ideal body weight, optional supply of Nutrients. , Metabolic consideration — VO2, lactate threshold, RQ, energy expenditure in terms of calorimetry. , Acute effects of exercise on — Cardiovascular, Respiratory, Metabolic (aerobic & anaerobic), Thermoregulatory, Buffer (pH), Neuro-musculoskeletal, Endocrine, Immune systems. , Conditioning effects (adaptations) of exercise on — Cardiovascular, Respiratory, Metabolic (Aerobic & anaerobic), Thermoregulatory, Buffer (pH), Neuro- Musculoskeletal (strength, power, endurance, speed, flexibility, agility, skill), Endocrine, Immune systems., Body composition , Exercise at different altitudes. , Exercise at various climatic conditions. , Special aids to performance and conditioning. , Exercise prescription for health and fitness with special emphasis on cardiovascular disease, Obesity and Diabetes. , Principles of health promotion for Growing Children, Healthy Adults, Pregnant /Lactating females, Elderly, Sports person, Aerobic and Anaerobic Exercise Training , Fatigue assessment, Types, and Relevance with Exercise Tolerance tests & Training and management , Fitness Testing for: (a). Aerobic power (b). anaerobic power and capacity (c). Muscular strength and power, flexibility., Obesity –exercises for weight reduction., Exercise and aging , Clinical exercise physiology	80
2	**Electro Physiology** Characteristics and components of Electro therapeutic stimulation systems and characteristics and components of Electro physiological assessment devices. , Electrical excitability of muscle and nerve and composition of peripheral nerves. , (A). muscle plasticity in response to electrical stimulation. (B). Instrumentation for Neuromuscular electrical stimulation (NMES) , Neurobiology of afferent pain transmission and central nervous system mechanisms of pain modulation. , Electrical stimulation and circulation. , Clinical Electro physiological testing. , Bio-electricity (R.M.P-Action Potential) , Neuro transmitters. Synapse & Synaptic transmission. , Classification-muscle fiber, nerve fiber, motor unit. , Propagation of nerve impulse & physiology of muscle contraction. , Reflex-classification & properties. , Sensations-Pathways & classification. , Type of nerve injury & Wallerian degeneration	20

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Contents : Unit	Topics	Contact Hours
3	**Biomechanics** Applied Anatomy 1. Anatomy of musculoskeletal system (Osteology, Myology, Arthrology) 2. Anatomy of Cardio Pulmonary system (Structure of heart, Structure of lung, broncho pulmonary 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, 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 e) Linear motion and its various parameters f) Projectile motions, Kinetics: a) Definition of forces b) Force vectors (composition, resolution, magnitude) c) Naming of Force (gravity and antigravity 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, Biomechanics for different aspects: 1. Biomechanics of: Bone and soft tissues, including muscles, ligaments, tendons, 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 parameters 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., 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	80

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Contents : Unit	Topics	Contact Hours
4	**Education Technology** 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). e. Philosophies of education in India – past, present and future. Role of educational philosophy, Current issues and trends in education., 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., 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., 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. Bloom's taxonomy of instructional objectives. Writing instructional objectives in behavioral terms., 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., 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	20

Contents : Unit	Topics	Contact Hours
5	**Ethics Management and Planning** Concept of Morality, Ethics, and Legality. , Rules of Professional conduct, Medico Legal and Moral Implications. , Communication skills, Client interest and Satisfaction. , Inter Disciplinary Relation, Co-partnership, Mutual Respect, Confidence and Communication, Responsibilities of the Physiotherapists, Status of Physiotherapist in Health Care., Role of Professional in Socio Personal and Socio Economical context. , Need of Council Act for regulation of Professional Practice. , Self–Regulatory role of Professional Association. , Rules of Professional Conduct. , Role of WCPT, Various branches and special interest groups of WCPT. 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, Administration & Marketing – personnel Policies –Communication & Contract. Administration principles based on Goal & Function at large Hospital / Domiciliary set up / Private Clinic / Academic Institution. , Methods of maintaining records – Budget planning , Performance analysis – Physical structure, reporting system, Man P Status, Functions, Quality & Quantity of Services, Turnover – Cost benefit, Contribution. , Aims of physiotherapy education, . Concepts of teaching and learning; Theories of teaching. 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, Guidance and counseling; principles and concepts, guidance and counseling services of students and faculty, 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., Hospital as an organization - Functions and types of hospitals, Roles of Physical therapist, Physical therapy Director, Physiotherapy Supervisor, Physiotherapy assistant, Physiotherapy aid, Confidentially of the Patient's status. Legal responsibility. Consumer protection law, health law, MCI. Standards of practice for physiotherapists. Liability and obligations in the case of medical legal action. Law of disability & discrimination	40

Contents : Unit	Topics	Contact Hours
6	**RESEARCH METHODOLOGY** Research in Physiotherapy – a) Introduction b) Research for Physiotherapist: Why? How? And When? c) Research – Definition, concept, purpose, approaches d) Internet sites for Physiotherapist , Research Fundamentals a) Types of variables b) Reliability & Validity c) Drawing Tables, graphs, master chart etc. , Writing a Research Proposal a) Defining a problem b) Hypothesis: function of hypothesis in quantitative research c) Types of hypotheses, 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 , Research Design a) Qualitative and Quantitative research designs – Difference between qualitative and quantitative designs b) Experimental design (i). Quasi experimental research; advantages and disadvantages of quasi experiments (ii). 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 , 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. , 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 , 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 , Writing research for publication a) Guidelines to publish a research paper and its contents , 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. , Research Ethics a) Importance of Ethics in Research, Ethical issues in human subject research, Ethical principles that govern research with human subjects b) Components of an ethically valid informed consent for research , Plagiarism	40

Contents : Unit	Topics	Contact Hours
7	**BIOSTATISTICS** Biostatistics a) Introduction b) Definition c) Types d) Application in Physiotherapy. , Data a) Definition b) Types c) Presentation d) Collection methods e) Various types of graphs, obtaining graphs using statistical software like excel , Measures of central value a) Arithmetic mean, median, mode, Relationship between them b) Partitioned values – Quartiles, Deciles, Percentiles. c) Graphical determination , Measures of Dispersion a) Range b) Mean Deviation c) Standard Deviation, 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. , 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 , Regression analysis a) Lines of regression b) Calculation of Regression coefficient , Sampling a) Methods of Sampling b) Sampling distribution c) Standard error d) Types I & II error , 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. , Hypothesis Testing a) Null Hypothesis b) Alternative hypothesis c) Acceptance & rejection of null Hypothesis d) Level of significance \, 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 , Learn SPSS software application and Graph Software application. [Not for Exam].	40
Total Hours		**320**

Textbook :

1 Human Movement Explained, Kim Jones, Karen Barker, Butterworth-Heinemann,, 1995

2 Physical Therapy Administration and Management, Robert J. Hickok, Williams & Wilkins, 1982

3 Essentials of Exercise Physiology, William D. McArdle, Frank I. Katch, Victor L. Katch , Lippincott Williams & Wilkins, 2006

4 Physiology of Sport and Exercise, W. Larry Kenney, Jack H. Wilmore, David L. Costill, Human Kinetics, 2015

5 Joint Structure And Function, Pamela K. Levangie, Jaypee Brothers Medical Publishers, 2019

6 Kinesiology: The Mechanics and Pathomechanics of Human Movement , Oatis, Carol A, PT , Lippincott Williams & Wilkins, 2009

References:

1 Clinical Neurophysiology: Nerve Conduction, Electromyography, Evoked Potentials, Clinical Neurophysiology: Nerve Conduction, Electromyography, Evoked Potentials, U.K. Misra, J Kalita , Elsevier Health Sciences, 2014

2 Clinical Electrophysiology: Electrotherapy and Electrophysiologic Testing, Clinical Electrophysiology: Electrotherapy and Electrophysiologic Testing, Andrew J. Robinson (Ph. D.), Lippincott Williams & Wilkins, 2008

3 ACSM's Guidelines for Exercise Testing and Prescription, ACSM's Guidelines for Exercise Testing and Prescription, ACSM, Wolters Kluwer Health, 2013

4 Clinical Kinesiology and Anatomy, Clinical Kinesiology and Anatomy, Lynn S. Lippert, MS, PT, F. A. Davis Company, 2011

5 Pedagogy physiotherapy education, Pedagogy physiotherapy education, C. S. Ram, AITBS India, 2013

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

1 Classroom teaching