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| <b>Branch Name:</b>          | <b>I MPT</b>                                                              |
| <b>Program Code:</b>         | <b>PT201/ PT202/ PT203</b>                                                |
| <b>Course Title:</b>         | <b>Biomechanics and Therapeutics (BCT)</b>                                |
| <b>Course Code:</b>          | <b>2PT2010103</b>                                                         |
| <b>Pre-requisite Course:</b> | <b>Kinesiology, Exercise Therapy, Electrotherapy, Allied Therapeutics</b> |

### Teaching and Examination Scheme:

| Teaching Scheme |               |        | Evaluation Scheme (Marks) |                       |                       |                       |               |
|-----------------|---------------|--------|---------------------------|-----------------------|-----------------------|-----------------------|---------------|
| Lecture (L)     | Practical (P) | Credit | Theory (Marks)            |                       | Practical (Marks)     |                       | Total (Marks) |
|                 |               |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |               |
| 90              | -             | 6      | 100                       | -                     | -                     | -                     | 100           |

### Course Outcomes:

1. Explain the fundamental principles of kinesiology and biomechanics, including kinetics, kinematics, and biomechanical analysis of human motion.
2. Analyze the biomechanics of the upper limb, lower limb, spine, and gait, and apply ergonomic principles in posture, lifting, and movement techniques.
3. Describe and apply various physiotherapy exercise techniques such as dynamic, plyometric, isokinetic, balance, coordination, and proprioceptive neuromuscular facilitation exercises.
4. Demonstrate understanding of electrodiagnostic and therapeutic modalities including EMG, nerve conduction studies, evoked potentials, and heating/cooling agents used in physiotherapy.
5. Integrate biomechanical and therapeutic principles in functional assessment, clinical reasoning, yoga practices, and evidence-based physiotherapy interventions.

### Contents: M.P.T BCT Theory (L)

#### SECTION A: Concepts of Biomechanics

BCT 1.1. Introduction to Kinesiology and Biomechanics. Biomechanics of Tissues and structures of the musculoskeletal system

BCT 1.2. Principle of Biomechanics

BCT 1.3. Nature and importance of Biomechanics in Physiotherapy.

BCT 1.4. Methods of kinetics and kinematics investigation

BCT 1.5. Introduction to biomechanical analysis of human motion.

BCT 1.6. Analytical tools and techniques –

Isokinetic Dynamometer,

Kinesiological EMG,

Electronic Goniometer,

Force Platform,

Videography.

BCT 1.7. Upper Extremity: Shoulder and Shoulder girdle, Elbow joint, Wrist joint and Hand.

BCT 1.8. Lower Extremity: Pelvic Girdle, Hip joint, Knee joint, Ankle & Foot

BCT 1.9. Spine

BCT 1.10. Gait

BCT 1.11. Gait Analysis: Kinetic & Kinematic Analysis.

BCT 1.12. Pathological Gait: Kinetic & Kinematic Analysis

BCT 1.13. Ergonomic approach to lifting and handling, workspace and environment. Patient Positioning, body mechanics and Transfer techniques

**SECTION -B: Physiotherapy techniques**

BCT 2.1. Principle of therapeutic exercises

BCT 2.2. Definition, details of effects and uses of following exercises.

BCT 2.3. Dynamic Exercises

BCT 2.4. Plyometric Exercises

BCT 2.5. Isokinetic Exercises

BCT 2.6. Kinetic chain exercises

BCT 2.7. Balance and coordination exercises

BCT 2.8. Biophysics of contractile and non-contractile tissues, Response to mechanical loading

BCT 2.9. Clinical reasoning and differential clinical diagnosis based on various approaches such as Maitland, Kaltenborne, Cyriax, Mulligan, McKenzie etc.

BCT 2.10. Proprioceptive neuromuscular Facilitation,

BCT 2.11. Hydrotherapy Techniques

BCT 2.12. Functional assessment and re-education

BCT 2.13. Yoga: Introduction, Historical background and Origin of Yoga, Meaning and Concept of Yoga and its relationship with Physical Education and Sports, Yoga in Global Scenario, Pranayama: Meaning, Types and its importance. Asanas: Asanas- meaning, types, principles, Techniques of asanas and effects of asanas on various systems of the body - circulatory, respiratory and digestive system.

BCT 2.14. Electro diagnosis: introduction to methods of electro diagnosis SD CURVE

BCT 2.15. Electromyography: technique of EMG, interpretation of normal and abnormal responses

BCT 2.16. Nerve conduction studies: MNCV, SNCV, variables affecting nerve conduction, measurement of NCV of nerves of upper limb and lower limb, interpretations of normal and abnormal responses.

BCT 2.17. Evoked potentials, H-reflex, P wave, repetitive nerve stimulation, VEP, BAEP, SSEP, SSR

BCT 2.18. Review of Principles underlying the application of following modalities with reference to their Production, biophysical and therapeutic effects, indications and contraindications and the specific uses of:

1. Superficial heating modalities
2. Deep heating modalities
3. Ultrasound
4. Cryotherapy

BCT 2.19. Review of Principles underlying the application of following modalities with reference to their Production, biophysical and therapeutic effects, indications and contraindications and the uses of Physiotherapy.

**Recommended books for BCT:**

1. James G. Hay – The Biomechanics of Sports Techniques, Prentice Hall.
2. Brunnstrom - Clinical Kinesiology, F.A. Davis.
3. Luttgens K., Hamilton N.: Kinesiology – Scientific Basis of Human Motion, Brown & Benchmark.
4. Kreighbaum E., Barthels K.: Biomechanics – A Qualitative approach for studying human Motion,
5. MacMillan.
6. Rasch and Burk: Kinesiology and Applied Anatomy, Lee and Fabiger.
7. White and Punjabi - Biomechanics of Spine - Lippincott.
8. Norkin & Levangie: Joint Structure and Function - A Comprehensive Analysis - F.A.Davis.
9. Kapandji: Physiology of Joints Vol. I, II & III, W.B. Saunders.

10. Northrip et al: Analysis of Sports Motion: Anatomic and Biomechanics perspectives,
11. W.C. Brown Co., IOWA.
12. Leveac B.F.: Basic Biomechanics in Sports and Orthopedic Therapy, C.V. Mosby.
13. De Boer & Groot: Biomechanics of Sports, CRL Press, Florida.
14. Basmajian - Muscle alive - Williams & Wilkins.
15. Nordin & Frankel - Basic Biomechanics of Muscular Skeletal System - Williams & Wilkins.
16. Bartlet - Introduction to Sports biomechanics - F & FN Spon Madras.

**List of Open-Source Software/learning website:**

- [k-hub.in](http://k-hub.in) e library/A single platform for all e resources (K-hub, E Resource)
  - User Name- KB4605VNG
  - Password- BL@69BX!
- [knowledgegainer.delnet.in](http://knowledgegainer.delnet.in) (Delnet, E Resource)
  - User Name-gjspum
  - Password- spu10924