Faculty of Sports Medicine & Physiotherapy

SYLLABUS

FOR

Masters in Physiotherapy (Sports)
(SEMESTER: I-II)
(Under Credit Based Continuous Evaluation Grading System)

Masters Degree in Sports Physiotherapy
(SEMESTER: III-IV)
(Under Credit Based Continuous Evaluation Grading System)

Session: 2015-16

GURU NANAK DEV UNIVERSITY AMRITSAR

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER SYSTEM)
(Under Credit Based Continuous Evaluation Grading System)

Scheme of Examination

A. Theory Examination:

Semester – I:

Course No.	C/E/I/A	Course Title	L	T	P	Total Credits
Core Courses						
SPL501	C	Applied Basic Medical Sciences	4	–	–	4
SPL502	C	Kinesiology	4	–	–	4
SPL503	C	Assessment & Evaluation in Sports Physiotherapy	4	–	–	4
SPL504	C	Research & Educational Methodology	4	–	–	4
Audit Course						
SPP511	A	Clinical Training–I	–	–	6	6

B. Practical Examination–24 Credits

Practical examination of 24 credits will be conducted at the end of 4th semester which includes patient evaluation and management, viva–voce etc.

C. Dissertation – 24 Credits

The topic of dissertation will be allocated in Second Semester and candidate will work for 2 semesters and submit a written thesis in 4th semester. The student will be awarded grade for the total number of credits earned in dissertation in II, III and IV semesters of study at the end of the IV semester.

Practical Attachments:

To enable the students to acquire practicing in hand on skills, maximum emphasis will be laid on regular practical classes, demonstration and clinical practice. The students will undergo Clinical / Field training in GNDU Campus / Sports Authority of India (Various Centres), National Institutes of Physiotherapy, Government Medical College Amritsar, other sporting centers and to the coverage of various tournaments as and when required and decided by BOC. The students will attend onfield training which consists of early morning hours and evening late hours inclusive of weekends.

***** The credits earned by a candidate in practical and dissertation during different semesters will be evaluated at the end of the 4th semester and the grade will be determined accordingly.

***** A candidate shall be required to maintain minimum of 5.62 SGPA at the end of each semester. A student getting 'C' or lower grade in any course in this discipline will be treated as having failed in that course and shall have to repeat the core/elective courses/or repeat/opt. another course in lieu of interdisciplinary/outside department course with approval of Board of Control, and will have to obtain at least 'C+' grade in that course within specified period as per the prevailing rules. The weights of 'C' and lower Grades will not be counted in SGPA or CGPA (according to syndicate proceeding, dated: 24.5.2010, Para No. 34).

** Interdisciplinary/Optional Course: to be offered from outside the department.

Semester – II:

Course No.	**C/E/I/A**	**Course Title**	**L**	**T**	**P**	**Total Credits**
Core Courses						
SPL551	C	Applied Para Clinical Sciences	4	–	–	4
SPL552	C	Biomechanics	4	–	–	4
SPL553	C	Physiotherapy Methods	4	–	–	4
SPL554	C	Sports Traumatology	4	–	–	4
Audit Courses						
SPP561	A	Clinical Training–II	–	–	6	6
SPD562	A	Dissertation	–	–	8	8
Elective Course (2 Credits)						
	E	Elective Course	2	–	–	2

* List of Elective Courses

Sr. No.	***Course Code***	***Course Title***
1.	SPL690	Evidence Based Practice in Allied Health Sciences
2.	SPL691	Women Health and Exercise

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Semester – III:

Course No.	C/E/I/A	Course Title	L	T	P	Total Credits
Core Course						
SPL601	C	Sports Physiotherapy Methods	4	–	–	4
SPL602	C	Kinanthropometry	4	–	–	4
SPL603	C	Exercise Physiology & Nutrition	4	–	–	4
SPL604	C	Non–Traumatic Medical Conditions of Athletes	4	–	–	4
Audit Courses						
SPP611	A	Clinical Training III	–	–	6	6
SPD612	A	Dissertation	–	–	8	8
Interdisciplinary/Optional Course (2 Credits)						
	I	Interdisciplinary/Optional Course	2	–	–	2

Semester – IV:

Course No.	C/E/I/A	Course Title	L	T	P	Total Credits
Core Courses						
SPL651	C	Sports Psychology	4	–	–	4
SPL652	C	Applied Exercise Physiology	4	–	–	4
SPL653	C	Medical Aspects of Sports Medicine	4	–	–	4
SPL654	C	Current Concepts in Sports Medicine	4	–	–	4
SPP661	C	Clinical Training (including clinical training in previous semesters)	–	–	24	24
SPD662	C	Dissertation (including Research Work done in previous semesters)	–	–	24	24

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–I)
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SPL501: Applied Basic Medical Sciences

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Unit – I: ***Applied General Clinical Anatomy***

1. **Anatomy of the Nerve Injuries**
    a. Anatomical and Physiological loss resulting from nerve injury.
    b. Relaxation of nerves
    c. Peripheral nerve entrapment

2. **Bodily Habitus**
    a. Characteristics and its correlation to anatomy

3. **Anatomical Angles and stiff joints**
    a. Anatomical Angles
    b. Optimal attitude for stiff joints
    c. Snapping joints

4. **The pathology of nerve, bones in terms of anatomy**
    a. Anatomical facts regarding bones
    b. Pathological facts
    c. Anatomical disturbances in various bone pathologies

5. **Anatomical basis of clinical tests**
    a. All clinical tests associated to sports medicine to be covered

6. **Anatomy of certain diseases**
    a. Headache
    b. Infections of the hand
    c. Common dislocations
    d. Lesions of supraspinatous and subdeltoid bursae
    e. Hernias associated with sports persons
    f. Low back pain
    g. Sciatica
    h. Lesions of inter–vertebral disk
    i. Abscesses of Spine

Unit – II: ***Applied General Physiology***

1. Blood

a. The various components of blood
b. Viscosity correlation
c. Oxyhemoglobin Dissociation curves
d. Interrelationship between pressure flow and resistance
e. Pressure volume curves
f. Stress relaxation of vessels

2. Cardiovascular system

a. Physical characteristics of systemic circulation
b. Pressure pulses
c. Oxygen demand theory of local blood flow circulation
d. Nervous control of blood circulation
e. Humorous control of blood circulation
f. Mechanisms of arterial pulse regulation
g. Hypertension
h. Cardiac output and its regulation
i. Cardiac output in normal stress conditions
j. Methods of measuring cardiac output
k. Normal coronary blood flow along with variations
l. Physiological basis of ischemic heart disease
m. The cardiac reserve
n. Physiological causes of shock

3. Temperature regulation

a. Regulation of body temperature

Unit – III: ***Applied General Physiology***

1. Neuromuscular System

a. Basic physics of membrane potentials
b. Recording of membrane potentials and action potentials with basics of Electromyogram
c. Mechanism of muscle contraction
d. Sources of energy for muscle contraction
e. Neural control of movement

2. Respiratory System:

a. Review of mechanics of respiration
b. Pulmonary volumes and capacities
c. Composition of Alveolar air
d. Transport of oxygen in blood
e. Carbon dioxide in blood
f. Regulation of respiration
g. Methods of studying respiratory abnormalities

3. Endocrine System:

a. Pituitary hormones and their functions
b. Thyroid hormones
c. Adrenocortical hormones
d. Insulin Glucagon hormones
e. Parathyroid hormones

References:

1. Synopsis of Surgical Anatomy – John Wright & Sons, Bristol
2. Gray's Anatomy – Williams & Warwick – Churchill Livingstone.
3. Grants – Methods of Anatomy – Basmajian & Sloncker – Williams & Wilkins.
4. Clinical Anatomy for Medical Students – Snells – Lippincott.
5. Textbook of Medical Physiology – Guyton – Mosby.
6. Pathologic Basis of Diseases – Robbins, Kotran and Kumar – W.B. Saunders.
7. The Pharmacological basis of Therapeutics – Goodman and Gilman – MacMillan.
8. Pharmacology and Pharmacotherapeutics – Satoskar & Bhandarkar – Popular Publications – Bombay.
9. Pathology implications for Physical Therapists – Goodmann & Boissonnault– W. B. Saunders.
10. Davidsons – Principles and Practice of Medicine– Edward – Churchill Livingstone.
11. Hutchinsons – Clinical Methods of Medicine –Swash – Bailliere Tindall.
12. Systems of Orthopedics – Apleys – Butterworth Heinmann.
13. Outline of Orthopedics – Adams – Churchill Livingstone.
14. Outline of Fractures – Adams – Churchill Livingstone.
15. Tureks – Orthopedics – Weinsteil & Buckwalter – Lippincott Publications.
16. Text Book of Radiology – Sutton D. – Churchill Livingstone.

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–I)
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SPL502: Kinesiology

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UNIT – I

Introduction:

1. Definition, aims, objectives and role of Kinesiology in sports physiotherapy.

2. Review of fundamental concepts (applied aspect), Centre of gravity, Line of gravity, Planes, Lever system in Body, Fundamental starting positions.

3. **Anatomical Concepts in Kinesiology**

   Frame work and joints of the body: Influence of trauma and classification of the muscles, Relation of structure, functions, role of muscles, types of Muscle, contractions (Static, Concentric and Eccentric), Two joint Muscles, Angle of pull, Role of Gravity affecting muscular action.

UNIT – II

1. Physical Properties of bone, cartilage and muscle and functional adaptation under pathological conditions.

2. General features of the following bones: Scapula, Ribs, Vertebrae, Bones of skull, Humerus, Radius, Ulna, Hip bone, Femur, Tibia and Fibula, Bones of hands and feet.

3. Joints: Definition and Classification of joints: Shoulder, Elbow, Knee, Ankle, Inter–vertebral joints, wrist joint, small joints of hand and foot.

4. Origin, insertion, nerve supply and action of all important muscles related to human movement.

UNIT – III

1. Motion, type of motion, Distance and speed, Displacement and velocity, Acceleration, Angular distance and Angular displacement, Angular Speed, Angular Velocity, Angular Acceleration, Inertia, mass, weight, Newton's Laws of motion, Units in linear and angular motion.
2. Force and its characteristics, internal and external forces, Classification of force system, Composition and resolution of forces. Friction, impact, elasticity, principles of spin and rebound, Eccentric forces. Couple, moment, Principles of Lever, Rotatory force, Gravity, Methods of finding centre of gravity, Principles of Equilibrium, Fluid mechanics, principles of projectile.

References:

1. Brunnstrom – Clinical Kinesiology, F.A. Davis.
2. Luttgens K., Hamilton N.: Kinesiology – Scientific Basis of Human Motion 9th Edi, 1997, Brown & Benchmark.
3. Rasch and Burk: Kinesiology and Applied Anatomy, Lee and Fabiger.
4. White and Punjabi – Biomechanics of Spine – Lippincott.
5. Kapandji: Physiology of Joints Vol. I, II & III, W.B. Saunders.
6. Mishra: Clinical Neurophysiology, B.I. Churchill Livingstone.

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–I)
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SPL503: Assessment & Evaluation in Sports Physiotherapy

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UNIT – I

1. Importance of assessment & evaluation, Methods of evaluation – Interview, Clinical Examination, Reliability & Validity of the tests, Investigative Procedures, Field Tests.
2. Evaluation of Physical Fitness.
3. Musculoskeletal screening

UNIT – II

1. Assessment of lower limb complex: Pelvis, hip, thigh, knee, leg, ankle and foot
2. Assessment of upper limb complex: Shoulder girdle, shoulder, arm, elbow, forearm, wrist and hand.

UNIT – III

1. Assessment of Gait deviations
2. EMG evaluation, diagnostic and kinesiological
3. Assessment of spinal column: Cervical, thoracic and lumboscaral, Tests of neural tension.

References:

1. Norkin & White: Measurement of Joint Motion – A Guide to Goniometry – F.A. Davis.
2. Dvir: Isokinetics: Muscle Testing, Interpretation and Clinical Applications, W.B. Saunders.
3. Reed: Sports Injuries – Assessment and Rehabilitation, W.B. Saunders.
4. Lillegard, Butcher & Rucker: Handbook of Sports Medicine: A symptom – Oriented Approach, Butterworth & Heinemann
5. Baker: The Hughston Clinic Sports Medicine Book, Williams & Wilkins.

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–I)
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SPL504: Research & Educational Methodology

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UNIT – I: ***Research Methodology***

1. **Introduction:**
    a. Importance of research in clinical practice
    b. Scientific approach
    c. Characteristics
    d. Purposes and limitations.

2. Ethical issues in research.

3. Structure, formulation and implementation of a research project

4. **Research Questions:**
    a. Selection and statement of problem
    b. Literature review
    c. Meta–analysis.

5. **Types of Research:**
    a. Basic and Applied
    b. Qualitative & Quantitative
    c. Descriptive & Experimental
    d. Longitudinal & Cross–sectional

6. **Data Analysis:**
    a. Statistical Tests of significance
    b. Correlation
    c. Reliability
    d. Validity
    e. Parametric and Non–parametric statistics

7. **Experimental Research:**
    a. Types of Sampling
    b. Variables
    c. Experimental design
    d. Factorial design

8. **Survey Research:**
    a. Conducting a survey
    b. Questionnaires
    c. Steps in conducting survey research
    d. Epidemiological research

UNIT —II:

1. **Presentation**
   a. Symposia
   b. Seminar
   c. Conference
   d. Journal
   e. Thesis
   f. Book
   g. Key element of scientific writing.

2. **Presenting Research**
   i) Writing and submitting papers
      (a) Strategies of paper writing
      (b) Design of paper writing
      (c) Tactics of paper writing
   ii) Where to publish
   iii) Poster presentation of a research paper
      (a) Pre ample
      (b) Poster space
      (c) Standard format
      (d) Planning
      (e) Design

3. **Review of an indexed refereed research paper.**
   i) Evaluating paper scientific merit.
   ii) Providing constructive feedback to the author.
   iii) Typical review formats for reviewing a paper
   iv) Reasons for rejection

4. **Oral Presentations at Conferences/Seminars**
   i) Preparing presentation
   ii) Duration of presentation
   iii) What to present

UNIT – III: ***Educational Methodology***

1. Aim, philosophy and issues in physiotherapy education

2. Principles and methods of teaching with respect to physiotherapy students and client: Strategies and planning of teaching, curriculum development, formation of course objective, time management, role of Audio – visual aids, method of knowledge dissemination.

3. Methods of outcome evaluation

Practicals:

The student will be required to prepare sample research proposal. He will have to teach at least one subject of Bachelor in Physiotherapy and will present the teaching plan.

References:

1. Mohsin S.M.: Research Methods in Behavioral Sciences: Orient Publications.
2. Colton: Statistics in medicine, Little Brown Company, Boston.
3. Mahajan: Methods in Biostatistics, Jay Pee Brothers.
4. Vincent: Statistics in Kinesiology, Human Kinetics.
5. Hicks: Research for Physiotherapists, Churchill Livingstone

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–II)
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SPL551: Applied Para Clinical Sciences

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UNIT – 1

Pathology:

1. Inflammation and repair
2. "Failed" healing responses
3. Regional considerations of Inflammation & repair of soft tissue injuries.

UNIT – II

Pharmacology:

1. Principles of drug action.
2. Basic pharmacokinetics and Pharmacodynamics.
3. The use of drugs in various musculoskeletal disorders.

UNIT – III

Radiology:

1. Basics of radiology including ultrasonography CT & MRI scanning
2. Imaging of the head and neck.
3. Imaging of spine.
4. Imaging of pelvis, hip and thigh.
5. Imaging of Patello Femoral Joint & Knee joint.
6. Imaging of the lower leg, foot and ankle.

References:

1. The Pharmacological basis of Therapeutics – Goodman and Gilman – MacMillan.
2. Pharmacology and Pharmacotherapeutics – Satoskar & Bhandarkar – Popular Publications – Bombay.
3. Davidsons – Principles and Practice of Medicine– Edward – Churchill Livingstone.
4. Systems of Orthopedics – Apleys – Butterworth Heinmann.
5. Outline of Orthopedics – Adams – Churchill Livingstone.
6. Outline of Fractures – Adams – Churchill Livingstone.
7. Tureks – Orthopedics – Weinsteil & Buckwalter – Lippincott Publications.
8. Text Book of Radiology – Sutton D. – Churchill Livingstone.

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–II)
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SPL552: Biomechanics

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UNIT – I

1. Nature and importance of Biomechanics in Sports Physiotherapy.
2. Principle of Biomechanics.
3. Introduction to biomechanical analysis. Recruitment & techniques – Isokinetic dynamometer, kinesiological EMG, electronic goniometer, force platform, videography.

UNIT – II

1. Biomechanics of shoulder and shoulder girdle motion, elbow motion, wrist and hand motion.
2. Biomechanics of pelvic motion, hip motion, knee motion, ankle & foot motion
3. Biomechanics of spinal motion.

UNIT – III

1. Gait analysis
2. Biomechanics of rowing, throwing, swimming, jumping and landing, running and other sports.

References:

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 9th Edi, 1997, Brown & Benchmark.
4. Kreighbaum E., Barthels K.: Biomechanics – A Qualitative approach for studying Human Motion, 2nd edi. 1985, MacMillan.
5. Rasch and Burk: Kinesiology and Applied Anatomy, Lee and Fabiger.
6. White and Punjabi – Biomechanics of Spine – Lippincott.
7. Norkin & Levangie: Joint Structure and Function – A Comprehensive Analysis – F.A. Davis.
8. Kapandji: Physiology of Joints Vol. I, II & III, W.B. Saunders.
9. Northrip et al: Analysis of Sports Motion: Anatomic and Biomechanics perspectives, W.C. Brown Co., IOWA.
10. Leveac B.F.: Basic Biomechanics in Sports and Orthopedic Therapy, C.V. Mosby.
11. De Boer & Groot: Biomechanics of Sports, CRL Press, Florida.
12. Basmajian – Muscle alive – Williams & Wilkins.
13. Nordin & Frankel – Basic Biomechanics of Muscular Skeletal Systm – Williams & Wilkins.
14. Bartlet – Introduction to Sports biomechanics – F & FN Spon Madras.

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–II)
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SPL553: Physiotherapy Methods

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UNIT – I ***Rehabilitation and Therapeutic Exercises***

1. Define Rehabilitation, Goals and Objectives of Rehabilitation in Sports, Clinical Evaluation phases of rehabilitation. (multidisciplinary approach)
2. Prehabilitation
3. Modern concepts in rehabilitation.
4. Definition, details of effects and uses of therapeutic exercises.
   a. Dynamic Exercises
   b. Plyometric Exercises
   c. Isokinetic Exercises
   d. Manipulative Techniques
   e. Kinetic chain exercises

UNIT – II ***Mobilization and Strengthening Techniques***

1. Factors affecting the joint range of motion prevention of stiffness, methods of joint mobilization.
   a. Testing for tightness and contracture of soft–tissue structures.
   b. Techniques of mobilizing the various joints of the body.
2. Types of Muscle Contractions and Muscle work, Strength of Muscle Contraction in terms of Motor units, Group action of muscles and its implication in designing an exercise program.
   a. Causes of muscle weakness. Prevention of disuse atrophy, Principles of treatment to increase muscle strength and function.
   b. Techniques of strengthening with respect to regional consideration.
   c. Various methods of progressive resisted exercise.
   d. Aquatic therapy in sports.

UNIT – III

1. Neuromuscular Training: Neuromuscular control, methods for improving neuromuscular control, proprioception and Kinesthetic sensation following different sport injuries.
2. Principles and application of neuromuscular facilitation techniques including PNF in sports.
3. Health club & fitness: Concept, group therapy
4. Physical Therapy and law: Medico legal aspects of physiotherapy, liability, negligence, malpractice, licensure, work man compensation
5. Morale and Ethics: Ethical Analysis of moral problem, ethical issues in physiotherapy

Practicals:

1. The students will undergo clinical training in the Health Centre on various apparatus of physical medicine. This training will constitute major part of the practical examination.
2. Clinical attachments in Physiotherapy wing of NSNIS, Patiala & JN Stadium, New Delhi and other centers of Sports Authority of India.

References:

1. Sinha A.G.: Principle and Practices of Therapeutic Massage – Jaypee Brothers, New Delhi
2. Gardiner M. Dena: The Principles of Exercise Therapy – CBS Publishers, Delhi.
3. Kisner and Colby: Therapeutic Exercises – Foundations and Techniques, F.A. Davis.
4. Basmajian John V.: Therapeutic Exercise, Williams & Wilkins.
5. Thomson et al – Tidy's Physiotherapy: Butterworth – Heinmann.
6. Wood & Baker: Beard's Massage, W.B. Saunders.
7. Kendall: Muscles – Testing and Function – Williams & Wilkins
8. Daniels and Worthinghams: Muscle Testing – Techniques of Manual Examination, W.B. Saunders.
9. First Aid to Injured: St. John's Ambulance Association.
10. William E. Prentice: Rehabilitation Techniques – Mosby.
11. Werner Kuprian: Physical Therapy for Sports, W.B. Saunders.
12. Norkin & White: Measurement of Joint Motion – A Guide to Goniometry – F.A. Davis.
13. Andrea Bates and Norm Hanson: Aquatic Exercise Therapy, W.B. Saunders.
14. Dvir: Isokinetics: Muscle Testing, Interpretation and Clinical Applications, W.B. Saunders.
15. Hartley: Practical Joint Assessment, A Sports Medicine Manual, upper and lower quadrants, C.V. Mosby.
16. Kennedy: Mosby's Sports Therapy Taping Guide.
17. Malone: Orthopeadic and Sports Physical Therapy, C.V. Mosby.
18. Albert: Eccentric Muscle Training in Sports and Orthopeadics, W.B. Saunders.
19. Voss et al – Proprioceptive Neuromuscular Facilitation – Patterns & Techniques – Williams & Wilkins.

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–II)
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SPL554: Sports Traumatology

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UNIT – I

1. Pre–participation examination
2. Causes & Mechanism of Sports Injuries, prevention of sports injuries
3. Common acute and overuse injuries of:
    a. Shoulder girdle, Shoulder, Arm, Elbow, Forearm, Wrist & hand
    b. Pelvis, hip, thigh, knee, leg, ankle & foot
    c. Spine
    d. Head

UNIT – II

1. Sporting emergencies & first aid
2. Cardio pulmonary Resuscitation; Shock management, Internal and External bleeding, Splinting, Stretcher use–Handling and transfer, Management of Cardiac arrest, Acute asthma, epilepsy, drowning, burn, Medical management of mass participation. Heat stroke and Heat illness.

UNIT – III

Sports specific injuries, with special emphasis on the specific risk factor, nature of sports, kind of medical intervention anticipated and prevention with respect to individual sports

a. Individual events: Field & Track
b. Team events: Hockey, Cricket, Football
c. Contact and Non–contact sports
d. Water sports

Clinical Training

1. Students will undergo Field Training with Sportsmen of the University.
2. They will attend Sports medicine clinic in the Health Centre.
3. Field Training at National Institute of Sports at Patiala & JN Stadium, New Delhi and other centers of Sports Authority of India.
4. The students will accompany sports teams for National sporting competitions.
5. No student will refuse clinical attachment even during the vacations.

References:

1. Morris B. Mellion: Office Sports Medicine, Hanley & Belfus.
2. Richard B. Birrer: Sports Medicine for the primary care Physician, CRC Press.
3. Torg, Welsh & Shephard: Current Therapy in Sports Medicine III – Mosby.
4. Zulunga et al: Sports Physiotherapy, W.B. Saunders.
5. Brukner and Khan: Clinical Sports Medicine, McGraw Hill.
6. Reed: Sports Injuries – Assessment and Rehabilitation, W.B. Saunders.
7. Gould: Orthopaedic Sports Physical Therapy, Mosby.
8. C. Norris: Sports Injuries – Diagnosis and Management for Physiotherapists, Heinmann.
9. D. Kulund: The Injured Athlete, Lippincott.
10. Nicholas Hershman: Vol. I The Upper Extremity in Sports Medicine.
    Vol. II The Lower Extremity and Spine in Sports Medicine.
    Vol. III The Lower Extremity and Spine in Sports Medicine.
    Mosby.
11. Lee & Dress: Orthopaedic Sports Medicine – W.B Saunders.
12. K. Park: Preventive and Social Medicine – Banarsi Dass Bhanot – Jabalpur..
13. Fu and Stone: Sports Injuries: Mechanism, Prevention and Treatment, Williams and Wilkins.
14. Scuderi, McCann, Bruno: Sports Medicine – Principles of Primary Care, Mosby.
15. Lars Peterson and Per Renstron: Sports Injuries – Their prevention and treatment, Dunitz.

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–II)
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SPL690: Evidence Based Practice in Allied Health Sciences (Elective)

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UNIT – I

1. Introduction to evidence– based complementary medicine
2. Evidence–based health care
3 .Evidence–based practices
4. Evidence–based decision making and management

UNIT – II

1. Types of evidence
   a. Definition of evidence
   b. Forms of evidence
   c. Randomized controlled trials
   d. Case–control studies
   e. Cohort studies

UNIT – III

1. Applying the evidence
   a. Pathways, guidelines and protocols
   b. Future directions for clinical effectiveness
2. Evaluation of effectiveness and efficiency of the process

References:

1. Martin Dawes, Philip Davies, and Alistair Gray, Evidence–Based Practice: A Primer for Health Care Professionals. Elsevier Publication.
2. Albert R. Roberts and Kenneth R. Yeager, Evidence–Based Practice Manual: Research and Outcome Measures in Health and Human Services, Oxford University Press.
3. Allen Rubin, Practitioner's Guide to Using Research for Evidence–Based Practice. John Willey & Sons Publication.
4. Domhnall MacAuleyThomas M Best, Evidence–based Sports Medicine. BMJ Books.
5. Kathryn Refshauge and Elizabeth Gass, Musculoskeletal Physiotherapy: Its Clinical Science and Evidence–Based Practice. Churchill Livingstone.
6. Allen Rubin, Statistics for Evidence–Based Practice and Evaluation. Cengage learning.
7. Bernadette Melnyk, Ellen Fineout–Overholt, Evidence–Based Practice in Nursing and Healthcare: A Guide to Best Practice, Lippincott Williams & Wilkins.

MASTER IN PHYSIOTHERAPY (SPORTS) (SEMESTER–II)
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SPL691: Women Health and Exercise (Elective)

L	T	P
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UNIT – I

1. Gender difference in muscle morphology
2. Diagnosis and Treatment of Urinary Incontinence and Prolapse
3. Anemia

UNIT – II

1. Hypertension in Women
2. Bone health: assessment and treatment of osteopenia and osteoporosis
3. Evaluation and Treatment of Common Musculoskeletal Complaints

UNIT – III

1. Exercise for the childbearing year
2. Exercise for adolescence
3. Exercise for the older woman

References:

1. Nadya Swedan (2001): Women's Sports Medicine and Rehabilitation. An Aspen Publication.
2. Mary Lloyd Ireland & Aurelia Nattiv (2002): The Female Athlete. Saunders Publication.
3. Cardozo L and Staskin D (2006): Textbook of Female Urology and Urogynaecology (2nd edn). London: Isis Medical Media Ltd.
4. Mantle J, Haslam J and Barton S (2004): Physiotherapy in Obstetrics and Gynaecology. (2nd Ed.) London: Butterworth–Heinemann.
5. Sapsford R, Markwell S and Bullock–Saxton J (1998): Women's Health: A Textbook for Physiotherapists. London: WB Saunders Company Ltd.
6. Bo, K., Berghmans, L.C.M., Van Kampen, M., Morkved, S. (2007). Evidence–Based Physical Therapy for the Pelvic Floor: Bridging Science and Clinical Practice. London: Churchill Livingstone.

MASTER DEGREE IN SPORTS PHYSIOTHERAPY (SEMESTER–III)
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SPL601: Sports Physiotherapy Methods

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UNIT – I

Massage:
Historical development. Definition and classification of massage techniques, Physiological effects of massage, Description of the techniques of the classical massage. Connective tissue massage, hysiological basis of sports massage and various categories, underwater massage, mechanical devices of massage, therapeutic applications and contraindications of massage.

Heat Therapy:
1. Production, Physiological effects, indications, contraindications and specific uses in sports of the following:
2. Infrared rays, Parafine Wax Bath, Steam Bath, Sauna Bath, Moist Heat Pack, Fluidotherapy, Mud Bath and Pelloids.

Hydrotherapy:
History & introduction, Effects of simple baths, raising temperature baths, baths with additives, Aromatic baths, Mineral baths, physical baths, Hydroelectric baths, Stammer baths, whirl pool bath, showers and steam showers.

UNIT – II

1. ***Electrotherapy:***
Principles underlying the application of following modalities with reference to their production, biophysical and therapeutic effects, indications and contraindications and the specific uses in Sports Physiotherapy.

a. Low Frequency Current: Direct Current, Modified Direct Current, Alternative Current, Diadynamic Current, Iontophoresis TENS, High Voltage, Pulsed Galvanic Stimulation.
b. Medium Frequency Current: IFT, Russian Currents.
c. High Frequency Currents:SWD, MWD, Ultrasound, Pulsed Electromagnetic Energy.
d. Radiations: LASER, UVR

2. Recent Advancement in Electrotherapy, Electrodiagnosis and its implications to Sports Physiotherapy.

UNIT – III

1. *Functional Bandages & Orthotic Aids:*

History and uses of functional bandages, classification according to the time of application, types of bandages, Bandaging techniques and bandaging material, Indications, contraindications athletic shoes and modifications, common orthotic aid and appliances in Sports.

2. *Cryotherapy:*

Physiological effects, Use of cold therapy in acute phase, rehabilitative phase, preventive phase of athletic injury, Methods of application, Indications and contraindications.

3. *Manual Therapy:*

Introduction to manual therapy techniques, joint techniques, manual joint therapy, traction, basic principles of manipulation for various disorders of the spine and extremities. Muscle energy techniques(MET)-definition, elements of MET procedures, clinical utilization of MET.

4. *Clinical Reasoning and Decision Making:*

Practicals:

1. The students will undergo clinical training in the Health Centre on various apparatus of physical medicine. This training will constitute major part of the practical examination.
2. Clinical attachments in Physiotherapy wing of NSNIS, Patiala & JN Stadium, New Delhi and other centers of Sports Authority of India.

References:

1. A.G. Sinha, Principle and Practices of Therapeutic Massage. Jaypee Brothers, New Delhi.
2. William E. Prentice: Therapeutic Modalities in Sports Medicine – Mosby.
3. William E. Prentice: Rehabilitation Techniques – Mosby.
4. O' Sullivan, Schmitz: Physical Rehabilitation – Assessment and Treatment – F.A. Davis.
5. John Low & Reed: Electrotherapy Explained, Butterworth.
6. Meryl Roth Gersh: Electrotherapy in Rehabilitation, FA Davis.
7. Joseph Kahn: Principles and Practice of Electrotherapy, Churchill Livingstone.
8. Claytons Electrotherapy 10th Ed. – Sarah & Bazin – W.B. Saunders.
9. Harrelson and Andrews: Physical Rehabilitation of Injured Athlete.
10. Nelson and Currier: Clinical Electrotherapy, Prentice Hall.
11. Greenman: Principles of Manual medicine, William and Wilkins.
12. Kuprian: Physical Therapy for Sports, W.B. Saunders.
13. Bates: Aquatic Exercise Therapy, W.B. Saunders.
14. Michlovitz – Thermal Agents in Rehabilitation – F.A. Davis.
15. Lehmann – Therapeutic Heat and Cold – Williams & Wilkins.

MASTER DEGREE IN SPORTS PHYSIOTHERAPY (SEMESTER–III)
(Under Credit Based Continuous Evaluation Grading System)

SPL602: Kinanthropometry

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UNIT – I

1. Introduction
   Significance of kinanthropometric knowledge in sports medicine.

2. Age determination
   a. Skeletal age
   b. Dental age

3. Body measurements
   a. Gross size and mass
   b. Lengths or heights of body parts
   c. Circumstances of body parts
   d. Skinfold thickness
4. Kinanthropometric study group measurements
   a. Planes of the body
   b. Axes of the body
   c. Landmarks on the body

UNIT – II

1. Body proportions
   a. Body mass index
   b. The phantom stratagem
   c. The Z – scores
   d. The O – scale system

2. Body composition
   a. Different Body composition
   b. Various methods to estimate body composition
      i. Water displacement method
      ii. Under water weighing methods
      iii. Kinanthropometric determination of the body composition (skinfold thickness)
      iv. Application of surface anthropometry (the body profile)
      v. Bioelectrical impedance analysis
      vi. Ultrasound assessment of fat
      vii. Arm X–ray assessment of fat
      viii. Computed tomography (CT) assessment of fat

UNIT – III

1. Somatotyping
    a. Sheldon's method of somatotyping
        i. Critical evaluation of Sheldon's method of somatotyping
    b. Heath – Carter method of somatotyping
        ii. The rating scales
        iii. Kinanthropometric measurements
        iv. First, Second and Third Components
        v. Somatotyping
        vi. Somatotype distribution

2. Growth, maturation and physical performance

Practicals:

The students will undergo hands on training on various Kinanthropometry equipment for body composition analysis, somatotyping and age determination.

References:

1. Singh and Malhotra: Kinanthropometry, Lunar Publications
2. H.S. Sodhi: Sports Anthropometry (A Kinanthropometric Approach), Anova Publications
3. Verma and Mokha: Nutrition, Exercise and Weight Reduction, Exercise Science Publication Society
4. Ostym, Beunen and Simons: Kinanthropometry II, University Park Press, Baltimore
5. James A.P. Day: Perspectives in Kinanthropometry, Human Kinetics Publishers, Inc. Champaign, Illinois
6. L.S. Sidhu et. al: Sports Sciences – Health, Fitness and Performance, IASSPE
7. L.S. Sidhu et. al: Trends in Sports Sciences, IASSPE

SPL603: Exercise Physiology & Nutrition

L T P
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1. ***Nutrition***

a. Carbohydrates, Fats, Proteins.
b. Vitamins, Minerals and Water.
c. Optimal Nutrition for exercise.
d. Nutrition for Physical Performance.
e. Pre–Game meal, Carbohydrate loading.
f. Alcohol, Mega Vitamin Therapy.
g. Food for various athletes of different disciplines.
h. Fluid and energy replacement in prolonged exercise.

UNIT – I

2. ***Energy Transfer for Physical Activity:***

a. Energy transfer in Body.
b. Energy transfer in exercise.
c. Energy expenditure during various activities.
d. Fatigue.
e. Biochemical responses to endurance training.

UNIT – II

1. ***Cardio Vascular System and Exercise:***

a. Athletes Heart.
b. Cardio Vascular adaptations to sustained aerobic exercises.
c. Lipids and sports, protection from coronary heart disease, exercise and optimization of lipid profile.
d. Sudden cardiac death in sports.
e. Regulation of circulation during exercise.

2. ***Exercise and Respiratory System:***

a. Air Conditioning.
b. Second Wind.
c. Oxygen Debt.
d. Breathe Holding, High Pressure Ventilation. Scuba Diving.
e. Athletes Lung.
f. Regulation of Respiration during exercise.

UNIT – III

1. *Skeletal System:*

a. Growth and Exercise.
b. Repair and adaptation during exercise.
c. Exercise prescription for chronic low back pain
d. Training for Muscular Strength and Endurance.

2. *Gastrointestinal Tract and Endocrine system:*

a. Effect of Sports on GIT and Liver.
b. Hormone regulation of fluid and electrolytes during exercise.
c. Exercise and Menstrual Cycle.
d. Stress Hormones in Exercise.
e. Effects of exercise on various Hormones in the body.
f. Opiods, Runners High.

Practicals:

The student will undergo laboratory and on–field training in exercise physiology.

References:

1. Mc Ardle, Katch, Katch: Exercise Physiology Edition IV.
2. Era Volinski: Nutrition and exercise in Sports – CRC Press, New York.
3. George A. Brooks, Thomas D. Fahey: Exercise Physiology – Human Bioenergetics and its applications 1984, John Wiley & Sons, New York.
4. Astrand & Rodahl: Text Book of Work Physiology, McGraw Hill.
5. Fox and Mathews – The Physiological Basis of Physical Education and athletics – Holt Saunders.
6. Erston and Reilly – Kinanthropometry and Exercise Physiology Laboratory Manual tests, Procedures and Data – F & FN Spon Madras.
7. Rowland – Developmental Exercise Physiology – Human Kinetics.
8. Clarke – Exercise Physiology – Prentice Hall.

MASTER DEGREE IN SPORTS PHYSIOTHERAPY (SEMESTER–III)
(Under Credit Based Continuous Evaluation Grading System)

SPL604: Non–Traumatic Medical Conditions of Athletes

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UNIT – I

Illness, Infections, Hypertension, Urine abnormalities; Venereal Diseases; Exercise induced Asthma; Anemia, Delayed Onset Muscle Soreness (DOMS), Runner's high & exercise addiction. G.I.T. Diseases, Exercises and congestive heart failure, exercise for post coronary & byepass patients, exercise for diabetics.

Diagnosis and management of skin conditions of Athletes, Bacterial infections, Fungal infections, Viral infections, boils and cellulitis.

UNIT – II

Female Specific Problems:

1. Sports Amenorrhoea.
2. Injury to female reproductive tract.
3. Menstrual Synchrony.
4. Sex determination.
5. Exercise and pregnancy.
6. Eating disorders in athletes.

UNIT – III

1. Common Diseases: Common Cold, Diarrhoea, Dysentery, Typhoid, Cholera, Amoebiasis, Food Poisoning, Tuberculosis, Malaria, Hepatitis etc.
2. AIDS in sports people.

Rheumatology & Geriatric Disorder:

1. Rheumatoid arthritis, SLE and Juvenile Rheumatoid Arthritis.
2. Ankylosing Spondylitis.
3. Rheumatology out patient clinic.
4. Osteoarthrosis and other geriatric conditions.

Practicals:

Students will attend the evening O.P.D. in the University health center to acquaint himself/herself of various medical problems.

References:

1. Morris B. Mellion: Office Sports Medicine, Hanley & Belfus.
2. Richard B. Birrer: Sports Medicine for the Primary Care Physician, CRC Press.
3. Torg, Welsh & Shephard: Current Therapy in Sports Medicine III – Mosby.
4. Zulunga et al: Sports Physiotherapy, W.B. Saunders.
5. Brukner and Khan: Clinical Sports Medicine, McGraw Hill.
6. Reed: Sports Injuries – Assessment and Rehabilitation, W.B. Saunders.
7. Gould: Orthopedic Sports Physical Therapy, Mosby.
8. C. Norris: Sports Injuries – Diagnosis and Management for Physiotherapists, Heinmann.
9. D. Kulund: The Injured Athlete, Lippincott.
10. Nicholas Hershman: Vol. I, The Upper Extremity in Sports Medicine.
    Vol. II, The Lower Extremity and Spine in Sports Medicine.
    Vol. III, The Lower Extremity and Spine in Sports Medicine.
    Mosby.
11. Lee & Dress: Orthopedic Sports Medicine – W.B Saunders.
12. K. Park: Preventive and Social Medicine – Banarsi Dass Bhanot – Jabalpur.
13. Fu and Stone: Sports Injuries: Mechanism, Prevention and Treatment, Williams and Wilkins.
14. Scuderi, McCann, Bruno: Sports Medicine – Principles of Primary Care, Mosby.
15. Lars Peterson and Per Renstron: Sports Injuries – Their prevention and treatment, Dunitz.

MASTER DEGREE IN SPORTS PHYSIOTHERAPY (SEMESTER–IV)
(Under Credit Based Continuous Evaluation Grading System)

SPL651: Sports Psychology

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UNIT – I

1. ***History and current status of Sports Psychology***.

2. ***Personality Assessment and Sports Personality:***
   a. Theories of personality
   b. Personality assessment

3. ***Attention and Perception in Sports:***
   a. Attention
   b. Perception

4. ***Concentration Training in Sports:***
   a. Basic principles of concentration
   b. Concentration training
   c. Concentration awareness exercises

5. ***Motivational Orientation in Sports***:
   a. Athlete's needs of motivation
   b. Motivational inhibitors
   c. Motivational techniques

UNIT – II

1. ***Pre–competitive Anxiety:***
   a. Source of PCA
   b. Effect of PCA on performance

2. ***Relaxation Training:***
   a. Definition
   b. Types of relaxation trainings
      i) Progressive muscle relaxation
      ii) Breathing exercises
      iii) Yognidra
      iv) Transcendental meditation

3. ***Aggression in Sports:***
   a. Theories of aggression
   b. Management of aggression

4. ***Role of Psychology in Dealing with Injuries.***

5. ***Eating Disorders:***
   a. Etiology of eating disorders
   b. Types of eating disorders
   c. Complications of eating disorders
6. **Goal setting.**

UNIT – III

1. Psychological aspect of doping
2. Psychological preparation of elite athletes
   a. Concept of psychological preparation
3. Biofeedback training
4. Mental imagery
5. Stress management
   a. Principles of Stress Management
   b. Stress Management techniques
6. **Group Behaviour and Leadership:**
   a. Nature of group behaviour and group.
   b. Types of group.
   c. Educational implication of group behaviour.
   d. Meaning of leadership, types of leadership quality of leadership, training and functioning of leadership.
7. **Emotion:**
   a. Meaning of emotion.
   b. Characteristics of emotion.
   c. Meaning of controlling and training of emotions and its importance.
   d. Contribution of sports to emotional health.
   e. Meaning of sentiment, its type, importance and formation.

Practicals:

1. Students will undergo practical training at Sports Psychology Lab at GNDU Campus, Amritsar.
2. Sports Psychology Lab. at National Institute of Sports, Patiala and JN Stadium, New Delhi of Sports Authority of India.

References:

1. Morgan and King: Introduction to Psychology – Tata McGraw Hill.
2. Suinn: Psychology in Sports: Methods and Applications, Surjeet Publications.
3. Grafiti: Psychology in Contemporary Sports, Prentice Hall.
4. Basmajian: Biofeedback.
5. Sanjiv P. Sahni: Handbook of Sports Psychology – A Comprehensive Manual of Mental Training.

MASTER DEGREE IN SPORTS PHYSIOTHERAPY (SEMESTER–IV)
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SPL652: Applied Exercise Physiology

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UNIT – I

1. ***Body Composition***

a. Composition of Human Body.
b. Somatotyping.
c. Techniques of Body Composition Analysis.

2. ***Aging and Exercise***

a. Aging and Physiological function.
b. Exercise and Longevity.
c. Coronary Heart Disease and Exercise.
d. Exercise Stress Testing for Diagnosis of CHD.
e. Exercise prescription for healthy aged.
f. Exercise prescription for sedentary adults.
g. Cost and benefits of exercise prescription in Osteoporosis.

UNIT – II

1. *Temperature Regulation*

a. Heat Balance.
b. Methods of Assessing Heat Balance.
c. Effects of Climate.
d. Effects of Exercise on Temperature Regulation.
e. Limit of Tolerance of Heat.
f. Acclimatisation.
g. Avoidance in Heat illness during exercise.
h. Exercises in cold.

2. *Misc. Topics*

a. High Altitude Training.
b. Sports Diving, Hazards of underwater environment.
c. Special Aids to Athletic Performance:– MORA, Oxygen Inhalation, Sleep.
d. Sex and performance.
e. Assessment of Age.
f. Muscle tissue fibre typing and its significance.
g. Exercise for mood enhancement & anxiety.

UNIT – III

Physiological Basis and Principles of Training and Conditioning

a. Principles of endurance and strength training
   i. Recovery training intensities in heart rate
   ii. Manipulation of training principles
   iii. Training sub–phases

b. Fundamentals that aid training and performance
   i. Warm up and Cool down
   ii. Flexibility and stretching
   iii. Missing workouts
   iv. Overtraining

c. Analysis of Training

Practicals:
Students will undergo laboratory and on field training in exercise physiology.

References:

1. Mc Ardle, Katch, Katch: Exercise Physiology Edition IV.
2. Era Volinski: Nutrition and exercise in Sports – CRC Press, New York.
3. George A. Brooks, Thomas D. Fahey: Exercise Physiology – Human Bioenergetics and its applications 1984, John Wiley & Sons, New York.
4. Astrand & Rodahl: Text Book of Work Physiology, McGraw Hill.
5. Fox and Mathews – The Physiological Basis of Physical Education and Athletics – Holt Saunders.
6. Erston and Reilly – Kinanthropometry and Exercise Physiology Laboratory Manual Tests, Procedures and Data – F & FN Spon Madras.
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MASTER DEGREE IN SPORTS PHYSIOTHERAPY (SEMESTER–IV)
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SPL653: Medical Aspects of Sports Medicine

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UNIT – I

1. ***Exercise and Common Pulmonary Conditions***
   a. Exercise induced bronchial obstruction
   b. Exercise in chronic airway obstruction
   c. Air pollution and exercise
2. ***Exercise and Cardiac Conditions***
   a. Exercise prescription for heart disease
   b. Exercise in primary prevention in ischemic heart disease
   c. Exercise for secondary prevention of ischemic heart disease

UNIT – II

1. ***Doping in Sports***
   a. Banned drugs
   b. Procedure of dope testing
   c. Control of doping abuse
2. ***Diabetes and Exercise***
   a. Exercise in diabetic patients
   b. Exercise as a method of control of diabetes

UNIT – III

1. ***Exercises for special categories***
   a. Child and adolescent athlete's problems
   b. Special problems of older athletes
   c. Special concerns for handicapped athletes
2. ***Misc. Conditions***
   a. Hazards of cold water
   b. Exercise for mood enhancement
   c. Vitamins and exercise
   d. Spinal deformity and sports
   e. Time zone shift and sleep deprivation problems
   f. Exercise in pregnancy and post partum

References:

1. Morris B. Mellion: Office Sports Medicine, Hanley & Belfus.
2. Richard B. Birrer: Sports Medicine for the primary care Physician, CRC Press.
3. Torg, Welsh & Shephard: Current Therapy in Sports Medicine III – Mosby.
4. Zulunga et al: Sports Physiotherapy, W.B. Saunders.
5. Brukner and Khan: Clinical Sports Medicine, McGraw Hill.
6. Reed: Sports Injuries – Assessment and Rehabilitation, W.B. Saunders.
7. Gould: Orthopaedic Sports Physical Therapy, Mosby.
8. C. Norris: Sports Injuries – Diagnosis and Management for Physiotherapists, Heinmann.
9. D. Kulund: The Injured Athlete, Lippincott.
10. Nicholas Hershman: Vol. I The Upper Extremity in Sports Medicine.
    Vol. II The Lower Extremity and Spine in Sports Medicine.
    Vol. III The Lower Extremity and Spine in Sports Medicine.
    Mosby.
11. Lee & Dress: Orthopaedic Sports Medicine – W.B Saunders.
12. K. Park: Preventive and Social Medicine – Banarsi Dass Bhanot – Jabalpur..
13. Fu and Stone: Sports Injuries: Mechanism, Prevention and Treatment, Williams and Wilkins.
14. Scuderi, McCann, Bruno: Sports Medicine – Principles of Primary Care, Mosby.
15. Lars Peterson and Per Renstron: Sports Injuries – Their prevention and treatment, Dunitz.

MASTER DEGREE IN SPORTS PHYSIOTHERAPY (SEMESTER–IV)
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SPL654: Current Concepts in Sports Medicine

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UNIT – I

1. ***Segmental Stabilization Concepts of Spine***
   a. Muscle function in spinal stabilization
   b. Contribution of various muscles to spinal stabilization
   c. Local Muscle dysfunction in Low back pain
   d. Principles of clinical management of deep muscle system for segmental stabilization
2. ***Emergency Medical Planning and cover for Sports Events***
3. ***Exercise for growing bones***
4. ***Effect of Physical activity intervention in youth***

UNIT – II

1. ***Precision heart rate training***
   a. Heart rate monitoring and training
   b. Training in heart zones
   c. Precision heart rate training for specific sports
   d. Multi Activity training
   e. Monitoring of training effects
2. ***Current concepts in obesity management***
   a. Childhood obesity etiology and role of exercise
   b. Obesity correlation with lipidogram
   c. Intra–abdominal obesity hazards
   d. Management of obesity

UNIT – III

1. ***Electromyography and Rehabilitation***
   a. Principles of EMG Rehab
   b. Muscular tone, fatigue and neural influences
   c. EMG in the evaluation of Sports Trauma
2. **Current concepts in comprehensive physical examination for the instabilities of knee.**
3. **Current concepts in tendinopathies.**
4. **Current concepts in plasma rich platelet therapy in sports**

Seminars and Groups Discussions:
It will be mandatory for the students to conduct seminars on the latest trends in sports medicine & sports physiotherapy.

References:

1. Mallarkey: Managing Obesity, Adis Publications
2. Burke: Precision Heart rate training, Human Kinetics Jull: Segmental Stabilization of Spine3.
3. Mishra: Clinical Neurophysiology, B.I. Churchill Livingstone.