

FITNESS AND WELLNESS

Unit: I - Concept

Concept of health, fitness and wellness – Components of health, fitness and Wellness – Factors influencing health, fitness and wellness – Relationship between health, fitness and wellness – Misconceptions of health and fitness Importance of health, fitness and wellness.

Unit: II - Assessment

Assessment of muscular strength and endurance, flexibility and cardio – vascular endurance – Grip test, sit-ups - test – leg and back muscular strength test – sit and reach test step test – 12 minutes cooper's run and walk test – AAHPERD youth fitness test – AAHPED Health – Related fitness Test.

Unit: III – Aerobic and Anaerobic exercise

Development of Muscular strength and endurance, flexibility and Cardio vascular endurance – Free exercises / Isometric and Isokinetic exercise – Barbell, Dumbbell and highest machine exercise – stretching exercises – Aerobic exercises – Exercise – Basic principles of training and conditioning Flexibility Training (Suppleness) – cardio respiratory Training (Stamina) Exercise prescription planning the Workout.

Unit: IV - Life style disease

Special problems and Exercise instruction – allergies to exercise – Anorexia – Arthritis – Asthma – Exercise Anemia Diabetes – Hypertension – Cardio vascular disorders – Back pain – Heel pain – knee pain – Exercise programme for children – Adolescents – youth – middle ages – senior client Exercise and pregnancy.

Unit: V- Nutrition

Nutrition for active people – Dietary guidelines – components of carbohydrates protein fat, minerals and vitamins balanced diet – Energy requirements in various activities – caloric expenditure – caloric calculation – Diet planning – Diet supplementation – Diet modification – food Facts and Fallacies Ergogenic aids – Drugs –Dopes - Diet and training under various conditions – Electrolyte and Water replacement.

Practical

1. Monitoring fitness
2. pedometer
3. PAR/Q
4. Preparation of balanced diet
5. SIT /HIT

6. Testing - Health related parameters
7. Cumulative health assessment

References:

1. Alton L. Thygerson & Steven M. Thygerson, (2016), Fit to Be Well, 4/e – Essential Concepts , ISBN. 978128042429.
2. Barbara Bushman, (2017), ACSM's Complete Guide to Fitness & Health, (2nd Edition),HK, 13: 9781492533672
3. Carry Egger, Nigel champion and Allan Botton, (1999), The Fitness leader's Hand book, Fourth Edition. A and C Block London.
4. Fleishman, Edwin A. (1967), The Structure and Measurement of Physical Fitness. Englewood Cliffs, N.J: Prentice – Hall, Inc.
5. Gordon Edlin & Eric Golanty, (2016), Health & Wellness, 12/e, ISBN. 9781284067293.
6. Houley E.T. and Franks B.D (1997), Health Fitness Instructor's Handbook. Third Edition. Human Kinetics', Champaign Illinois.
7. Jeff Housman & Mary Odum, (2016), Alters & Schiff Essential Concepts for Healthy Living, 7/e, ISBN. 9781284049978.
8. Jerome E.Kotecki, (2018), Physical Activity & Health, 5/e – An Interactive Approach, ISBN. 9781284102307.
9. Jerrold S. Greenberg, (2014), Empowering Health Decisions, ISBN.9781449690403.
10. Lederberg, J. "Health in the World of Tomorrow" Pan American Health Organization, Sanitary Bureau, WTO.
11. Linda Lewis Alexander, William James Alexander, Judith H. LaRosa, Helaine Bader & Susan Garfield, (2017), New Dimensions in Women's Health, 7/e, ISBN. 9781284088434.
12. Manoj Sharma, (2017), Theoretical Foundations of Health Education and Health Promotion, 3/e, ISBN.9781284104943.
13. Mike Bates, (2008), Health Fitness Management, (2nd Edition eBook), HK, 13: 9780736089609.
14. Tana S. Page & Randy M. Page, (2015), Promoting Health and Emotional well – Being in your Classroom, 6/e, ISBN. 9781449690267.

FUNCTIONAL TRAINING AND EVALUATION

UNIT-I - SPORTS TRAINING

Definitions, Aim, Objectives and Characteristics, Principles of Sports Training - Sources of Energy: Anaerobic, Lactic and Aerobic Sources of Energy -Training Methods Employed for Excellence:- Continuous Method and its Variations; Interval Methods and Repetition Method and the Physiological Effects, Training & Psychic Effects of Training Methods; Circuit Training; Plyometrics Training

UNIT-II - TRAINING LOAD, ADAPTATION AND RECOVERY

Concept of Load, Training & competition Demands & Degree of Load, Process of Load and Adaptation, Relationship of Load and Recovery, Factors of Load, Relationship Between Volume and Intensity - Dynamics of Increasing the Volume and Intensity, intensity Zones for Strength, Speed, - Endurance and Cyclic Sports - Means to Assess the Load, Fatigue and Symptoms of Fatigue Overload, Causes and Symptoms of Overload, Tackling of Over Load Recovery, Factors affecting Recovery, Means and Methods of Recovery.

Unit -III- BIO-MOTOR ABILITIES

Strength, Speed, Endurance, Flexibility and Coordinative abilities Definition; Physiological Characteristics of Bio-Motor Abilities ; Factors affecting Bio-Motor Abilities; Methods of Training to improve Bio-Motor Abilities; Methodological parameters related to Training; Load Factors in relation to Training; Training Methods for Development of various Forms of Bio-Motor Abilities.

UNIT-IV - TECHNICAL AND TACTICAL PREPARATION

Definition and Meaning of Technique, Skill and Style, Motor Coordination and Motor Learning, Aim of Technique in Sports - Technique Training in various Phases, Implications for Technique Training, Methods - Employed for Technique Training - Definition and Meaning of Tactics, Significance of Tactics, Aim of Tactics According to Sport - Tactical Action and its Phases, Training for Tactics - Principles of Tactical Preparation

UNIT-V-Planning, Periodization and Talent Identification

Definition, Need and Importance in Planning, Principles of Planning, Types of Plan – Periodization - Periodization of Bio-Motor Abilities (Strength, Endurance and Speed)

Competition, classification and characteristics of competition, the number and frequency of competition, methods of talent identification, criteria used for Talent Identification, Phases of Talent Identification, Guidelines for Talent Identification, Factors for Talent Identification Test - Standardized test – assessment of bio-motor abilities – major sports and games skill test.

PRACTICAL

1. Assessment of Maximum Strength
2. Assessment of Explosive Strength in Vertical and Forward Direction
3. Assessment of Muscular Endurance for Arms and shoulder girdle, abdominal muscles of the Legs, General Muscular Endurance of the body
4. Assessment of Endurance through – 12 minute and 9 minute run walk test, six hundred yards run-walk test- Harvard step test - Forestry Step Test.
5. Assessment of Speed - four second dash test - SIX Second Dash Test; 50 Yards Dash Test, 30 & 40 Yards Dash Test.
6. Assessment of Flexibility - ~ridge-up Test; Sit and Reach Test; Front to Rear Split Test and Side Split Test, Shoulder and Wrist elevation Test; Trunk and Neck Extension Test; Shoulder Rotation Test, Ankle Plantar and Dorsi Flexion Test.
7. Assessment of Coordinative Abilities - Burpee Test; Side Step Test; Quadrant Jump Test; Semo- Agility Test; LSU Agility Test; Bass and Modified Bass Test; Nelson Test of Hand Reaction; Foot Reaction and Speed of Movement.
8. Periodizing Strength, Speed and Endurance Development Programme
9. Preparation of Annual Plan, Macro Cycle Plan, Meso Cycle Plan, and Micro Cycle Plan.
10. Preparation of Circuit Training Programme with & without Weights.
11. Preparation of Plyometric Training Programme.

References:

1. Baumgartner Jackson, (1991). Measurement for Evaluation, USA, W.M.C Brown Publishers.
2. Hardayal Singh, (1984), Sports Training, General Theory and Methods, NSNIS, Patiala.
3. Herbert A. Devries and Terry J. Housh, (1996), *Physiology of Exercise for Physical Education, Athletics and Exercise science*, (5ED), USA; Brown & Benchmark Publishers.
4. Dintiman, George Blough, (1998). *Sports Speed*, (2nd ED), Champaign Illinois: Human Kinetics Publishers Inc.
5. Edward L. Fox, (1989). *The Physiological Basis of Physical Education and Athletics*, (3rdED), New York: W.M.C. Brown Publishers.

6. Epley, Boyd, (2004). *The Path to Athletic Power*, Champaign Illinois: Human Kinetics Publishers Inc.
7. Frank W.Dick, (1980), *Sports Training Principles*, Henry Kimpton Ltd.ISBN:0860190366.
8. Gavin L. Moir, (2016), *Strength and Conditioning – A Biomechanical Approach*, ISBN: 9781284034844.
9. Gordon E. Robertson, Graham E. Caldwell, Joseph Hamill, Gary Kamen and Saunders N. Whittlesey, (2014), *Research Methods In Biomechanics 2nd Edition*, Human Kinetics, 9780736093408.
10. James R.Morrow, Allen W.Jackson, James G.Disch ad Dale P.Mood, (2000), *Measurement and Evaluation in Human Performance (2Ed)*, Human kinetics.
11. Jay Hoffman, (2002), *Physiological Aspects of Sports Training Performance*, Champaign Illinois: Human Kinetics Publishers Inc.
12. Johnson, Barry L. and Nelson, Jack K. (1988). *Practical Measurements for Evaluation in Physical Education*, (3rdED), Delhi: Surjeet Publications.
13. Knuttgen and Kraemer, “Anaerobic Power” As Cited in Hoffman, Jay, (2002). *Physiological Aspects of Sports Training Performance*, Champaign Illinois: Human Kinetics Publishers Inc.
14. Lee E. Brown, et al., (2000), *Training for speed, Agility and Quickness*, Champaign Illinois: Human Kinetics Publishers Inc.
15. Ronald P.Pfeiffer, Brent C. Mangus & Cynthia A. Trowbridge , (2015) , *Concepts of Athletic Training*, 7/e –ISBN: 97812840341127.
16. Ted A. Baumgartner, and Andrew S. Jackson, (1991), *Measurement for Evaluation in Physical Education and Exercise Science*, U.S.A.: W.M.C. Brown Publishers.
17. Thomas R. Baechle and Barney R. Groves,(1992), *Weight Training Step ton Success*, Champaign Illinois: Human Kinetics Publishers Inc., 1992.
18. Thomas R., Baechle (1994), *Essentials of Strength Training and Conditioning*, Champaign Illinois: Human Kinetics Publishers Inc.
19. Tudor O. Bomba, (1999). *Periodization: Theory and Methodology of Training*, (4th ED), Champaign Illinois: Human Kinetics Publishers Inc.
20. Tudor O. Bomba. and, Coracchia, Lorenzo (1998), *Serious Strength Training*, Champaign Illinois: Human Kinetics Publishers Inc.
21. Wilf Paish (1991).*The Complete Manual of Sports Science*. London: A & C Black Ltd.
22. William J. Kraemer and Steven J. Fleck (1993). *Strength Training for Young Athletes*, Champaign Illinois: Human Kinetics Publishers Inc.

APPLIED YOGIC SCIENCE

Unit – I -Yoga: Nature, Need, Philosophy, History and Scope of Yoga - Modern Developments - Misconceptions and clarifications of Yoga- Paths of Yoga- Ashtanga - yoga- Schools of Yoga - Important of yogic practices- Benefits of Yoga on human systems - Yoga for consciousness - Computer Applications in yoga – Yoga and education, yoga and physical education.

Unit - II- Contributions and its relevance to yoga : Vedas, Upanishads, Tantra, Bhagavad Gita, Yoga Vasishtha, Yoga Sutras – thirumandiram, Yoga Yajnavalkya samhita, Goraksataka, Hatha yoga pradipika - Gheranda Samhita, Siva samhita, Hatha Ratnavali, Siddha Siddhanta Paddihati, Narada Bhakthi Sutras, Yoga Rahasya

Unit - III - Contributions to yoga by Ramakrishna, Swami Vivekananda, Srvananda, Maharishi Mahesh Yogi, Swami Rama, Krishnamacharya, Swami Kuvalayananda, Ramana Maharishi, Vethathiri Maharishi, Swami Dayanand Saraswati - Spirituality- Role of yoga and Religions on Spirituality- values- Methods to promote spirituality- Methods of teaching, Lesson plans, teaching aids - usage of props.

Unit – IV - Yoga and psychology - Facets of psychology and yoga - Yoga for psychological qualities - Yogic practices for various age groups - yogic practices for various professionals - "top and Women - Yoga and Sports - Yoga ... Mind - Nadis and chakras - Role of Yoga on personality development.

Unit -V- Modification of yogic practices and its applications -Health, fitness " Wellness - causes of diseases and disorders, Nutrition - diet - Yogic diet - Yoga Therapy - Diagnostic tools - Modifications of Yogic practices - Yogic practices for insomaia , Hypertension, Diabetics, Obesity, Asthma, Back pain, Arthritis, Constipation, Neurosis, Psychosis and Personality disorders - Women Disorders - Yoga Ed 1DdiaD Traditional systems of Medicine and therapies: Ayurveda, Siddha, Naturopathy, Physiotherapy, Varmam, Acupressure, Acupuncture, Music Therapy, Color Therapy – Recent trends research in yoga – research findings in yoga and yoga therapy.

Practical

1. Corrective asanas
2. Yogic treatment for the life style disorders

References:

1. B.K.S.Iyengar, (2001), Light on Yoga (Yoga Dipika) Revised Edition: Harper Collins Publishers, Daryaganj, New Delhi, India.

2. Gharote M.L. and Ganguly S.K. Teaching Methods for Yogic practices. Kaivalyadharna SMYM samit, Lonavla, Pune Dist, Maharashtra
3. Gharote M.L., Applied Yoga (Xth edition) Kaivalyadhama, Lonavla, Pune
4. Karambelkar P.V., (1999), Patanjali Yoga Sutras Kaivalyadhama, Lonavla, Pune Dist, Maharashtra.
5. Luis S.R. Vas (2001), Master approaches to New age Alternative Therapies, Pustak Mahal, New Delhi.
6. Naga Rathna R. and Nagendra H.R., (2008), New perspectives In Stress Management Swami Vivekananda Yoga Prakashana, Bangalore.
7. Nagarathna.R , Nagendra H.R. & Shamanthakamani Narendran, Yoga for common ailments and IAYT for different Diseases, Swami Vivekananda Yoga Praksana, Bangalore.
8. Nagendra H.R and NagaRathna.R, Yoga in Education, SVYP, Bangalore.
9. Sri. Natarajan Thirumular Thirumanthiram (English Translated from Tamil) Ramakrishna Math, Mylopore, Chennai
10. Swami Asthosh Ananthar, Sri Mad Bhagavad Gita, Sri Ramakrishna Math, Mylopore, Chennai
11. Swami Digambaraji, (2000), Hathayoga pradipika Kaivalyadhama SMYM, Lonavla, Pune Dr. H.R.Nagendra Pranayama (the art & science) Swami Vivekananda Yoga Prakashana, Bangalore.
12. Swami Kuvalayananda and Dr.S.L.Vinekar, (1963), Yogic Therapy, Kaivalyadhama SMYM Samit, Lonavla, Pune Dist, Maharashtra.
13. Swami Kuvalayananda Pranayama Kaivalyadhama SMYM Samit, Lonavla, Pune Dist, Maharashtra
14. Swami Satyananda Saraswathi A Systematic course in the Ancient Tantric Techniques of Yoga and Kriya. Bihar School of Yoga, Munger, Bihar, India.
15. Swami Satyananda Saraswathi,(2008), Asana Pranayama Mudra Bandha (IV Revised Edi) Bihar School of Yoga, Munger, Bihar India.
16. Swami Vishnu Devananda, (1995), The complete Illustrated Books of Yoga Harmony Books, a division of crown publications, New york.
17. Udupa K.N. and Singh H.R., (1978), Science and Philosophy of Indian Medicine Shree Baidyananth Ayurveda Bhawan Ltd., Nagpur.

APPLIED SPORTS AND EXERCISE PSYCHOLOGY

Unit: I

The Foundation of Sports Psychology

- Brief History of Sports Psychology, meaning, definition and Boundaries of Sports Psychology
- Research Methods and Testing in Sports Psychology
- Principles and Conditions of Motor Skill Learning
- Meaning Nature & Dimensions of Developmental Psychology
- Factors Affecting Growth & Development

Unit: II

Participation in Sports

- Socialization in Sports, Perception of Influence of various Socialization agents.
- Defining Motivation, Theories of Motivation, Motivation to continue or Discontinue participation in sports
- Structure of Personality, Theories of Personality and Measurement of Personality
- Influence of Athletic Participation on Personality Development

Unit: III

Sports Psychology and Athletic Performance

- Information Processing and Attention in Sports
- Meaning and Definition of Arousal – Neurophysiology of Arousal
- Relationship between Arousal and Athletic Performance
- Stress and Anxiety in Sports
- Role of Stress and Anxiety on Sports Performance

Unit: IV

Sport- Psychology Interventions

- Cognitive Intervention in sport – imagery in sport inoculation Training
- Psychological Skill Training
- Training for Sport – Attention Control Training
- Relaxation Procedures and Psyching up strategies
- Bio feedback Technology and Application of Bio – feedback for Mental Training

Unit: V

Social Nature of Sports

- Meaning, Definition and Theories of Aggression
- Team Cohesion- Development and Measurement of Team Cohesion
- Effects of Audience and Home Advantage in Sports
- Leadership in Sports – the Traits & Behaviour of Successful Leader
- Athletic Problem – Resist Coaching, The Con Man, Hyper Anxious, Success Phobia and Depression Prone Athletic.

Practical

1. Testing Pre- Competitive Anxiety
2. Mirror Drawing
3. Maze Learning
4. Assessment of Personality (16 Point PF Personality Test)
5. Assessment of Mental Ability (I.Q)
6. Test of Adjustment
7. Test of Attention
8. Reaction Time Testing
9. Assessment of Aggression

SPORTS BIOMECHANICS

UNIT-I

Sports and exercise biomechanist- role and functions- research, scientific support services, education, consultancy- Analysis services; qualitative analysis, quantitative analysis- Procedures; ethics, pre analysis preparation, detailed reporting.

Unit-II

Motion analysis using video- equipment considerations- video cameras, picture quality, frame rate, shutter speed, manual iris and low light sensitivity, gen lock capability, recording medium, recording and storage device, specification of computer, capture software, video playback system, coordinate digitiser- data collection procedures- two dimensional and three dimensional video recording- reporting a video motion analysis study.

Unit-III

Motion analysis - Equipment considerations- data collection procedures- processing, analyzing and presenting motion analysis data- reporting a motion analysis study. Force and pressure measurement - Force platform- construction and operation- technical specification- calibration- applications- Pressure distribution measurements- reporting a force or pressure analysis study.

Unit-IV

Surface electromyography- equipment considerations- data collection procedures; electrode configuration, location and orientation, skin preparation, cross talk- sampling- processing, analysing and presenting EMG- reporting an EMG study. Isokinetic dynamometry-Applications of isokinetic dynamometry- mechanical basis of isokinetic dynamometry measurements- isokinetic equipment considerations- isokinetic experimental and data collection procedures- processing, analysing and presenting isokinetic data- reporting an isokinetic study.

UNIT-V

Biomechanics and performance analysis software – quintic, Dartfish, KINOVEA, Silicon coach, Langomatch, BTS gait – basics – installation procedures- Basics, tools, system requirements.

Practical

1. Sports movements analysis through software
2. Running gait analysis

Reference

1. Duane V. Knudson, (2007), Fundamentals of biomechanics, Springer.
2. Kathryn Lutgens, (1992), Kinesiology (Scientific Basis of Human Motion), Brown and Bench mark.
3. Paul Grimshaw , (2007), Sports & Exercise Biomechanics, Taylor & Francis Group.
4. Peter McGinnis, (2005), Biomechanics of Sport and Exercise, Human Kinetics.
5. Roger Bartlett, (2007), Introduction to Sports Biomechanics Analyzing Human Movement Patterns, Routledge.
6. Susan J. Hall,(2004), Basic Biomechanics, McGraw Hill Education.

ETHICS IN SPORTS

Unit –I

Concept of Ethics in sports – Sports Culture – Sporting challenges – Sporting behavior and self control – Motivation and Spectators values – Ethical issues in sports

Unit-II

Sportsmanship - Fair Play – - Treating opponents - Respecting the judgment of officials – Corrupt officials - Match Fixing

Unit –III

Responsibilities of the coach – relationship among coach, parent, practitioners, opponents, officials and other agents – teaching, Training and coaching values

Unit – IV

Characters of Ethical decision – Truthfulness - responsibility of players in on and off the field – advantages and disadvantages of Fairness and unfair play

Unit –V

Caring of teammates – citizenship – ethical principle – role of sports organization/federations – guideline for ethical issues in sports – role of Government support

References:

1. Ivo van Hilvoorde, (2017), Sport and Play in a Digital World (Ethics and Sport), Routledge.
2. Jawaid Ali, (2012), Ethics in Sports Management, ISBN: 9788175246461, 8175246464.
3. John C. Maxwell, (2015), Ethics 101, ISBN.9789350098745
4. Robert a Berg (2015), Ethical Sports Manual, ISBN 9781682136669
5. Sigmund Loland, (2002), Fair Play in Sports, Routledge.
6. William J. Morgan (), Ethics in Sports, (2ED), HK.

EXERCISE PHYSIOLOGY

Objectives:

Researcher able to

1. Learn the muscular structure and its contraction theory
2. Realize the importance of bioenergetics and hormonal regulation
3. Learn the nutritional concepts of sports training
4. Become skilled at Exercise Prescription for Health and Fitness

Unit: I

The Nature of Skeletal Muscles

Gross Structure, the Myofibril, Sliding Filament Theory, Muscle Fibre Types and Athletic Success, Factors influencing development of muscular force, Response and adaptation of Muscles to varied exercise and training ;programme

Neural Co- ordination of Muscular Movement

Structure of the Neuron, Resting Membrane Potential, Action Potential and its Propagation, Nerve to Nerve Synapse, Neuromuscular junction, Muscle Fiber Recruitment, Proprioceptors, Nervous system and motor skill, neural adaptation to resistance training.

Unit: II

Bio Energetics

Anaerobic and Aerobic Systems and ATP Production, Oxidative Capacity of Muscle, Estimating Anaerobic Effort, BMR, Maximal Capacity for Exercise (VO₂ max), Resting Energy Expenditure, Energy cost of Activities, Fatigue and its Causes.

Hormonal Regulation of Exercise

Mechanism of hormone action, Endocrine glands their hormones and its response and adaptation to exercise and training.

Unit: III

The Cardio system and Respiratory System During Exercise and Training - Environmental Aspects of Sport Performance - acclimatization

Unit: IV

Women in Exercise and Sport - Exercise Sport and Aging - Trainability of the Young Athlete - Issues related to the growth and development of selected body tissues, physical and physiological changes accompanying growth and development, Trainability of the Young Athlete.

Unit: V

Nutritional Aspect of Sport Performance - Concept of Body Composition - severe weight loss, Optimal Weight loss, Obesity its Causes, Consequences and Prevention - Concept of exercise Prescription - Steps to be considered in Exercise Prescription - Factors affecting an individualized exercise program - Recommended Training Principles, Exercise Guidelines for Pregnant Women, Elderly and other population.

Practical

1. Assessing the Heart rate during:
 - a) Rest
 - b) Pre-exercise
 - c) During exercise
 - d) During recovery
2. Measurement of Vital Capacity and Peak flow Rate
3. To Measure the Anaerobic power
4. Assessment of Body Composition
5. Test of Cardio – respiratory Fitness
 - a) Step Test
 - b) Endurance Run/Walk Test
 - c) Bike Test
 - d) Treadmill Test
 - e) Any other field / Lab test
6. Basic Practical math in Exercise and fitness testing
 - i) Determining Resting Energy Expenditure
 - ii) Calculation of Energy cost of
 - Level Walking
 - Walking up a percent grade
 - Running
 - Stepping
 - Cycling
 - iii) Calculation of
 - Exercise Intensity
 - Workload
 - Frequency
 - Running Speed, percent Grade
 - Absolute VO₂, Relative VO₂
 - MET Level
 - Converting MET to Kcal

- Basic Conversion Calculations

Learning Outcome: Scholar able to

1. Know the cardio system and exercise effects
2. Know the respiratory system and exercise effects
3. Know the metabolism and energy transfer during and after the exercise.
4. Understand climatic conditions, sports performance and ergogenic aids on exercise.
5. Know the various testing procedure related to exercise physiology

References:

1. Baumgartner Jackson, (1991). Measurement for Evaluation, USA, W.M.C Brown Publishers.
2. Herbert A. Devries and Terry J. Housh, (1996), Physiology of Exercise for Physical Education, Athletics and Exercise science, (5ED), USA; Brown & Benchmark Publishers.
3. Dintiman, George Blough, (1998). Sports Speed, (2nd ED), Champaign Illinois: Human Kinetics Publishers Inc.
4. Edward L. Fox, (1989). The Physiological Basis of Physical Education and Athletics, (3rdED), New York: W.M.C. Brown Publishers.
5. Epley, Boyd, (2004). The Path to Athletic Power, Champaign Illinois: Human Kinetics Publishers Inc.
6. James R.Morrow, Allen W.Jackson, James G.Disch ad Dale P.Mood, (2000), Measurement and Evaluation in Human Performance (2Ed), Human kinetics.
7. Jay Hoffman, (2002), Physiological Aspects of Sports Training Performance, Champaign Illinois: Human Kinetics Publishers Inc.
8. Johnson, Barry L. and Nelson, Jack K. (1988). Practical Measurements for Evaluation in Physical Education, (3rdED), Delhi: Surjeet Publications.
9. Knuttgen and Kraemer, “Anaerobic Power” As Cited in Hoffman, Jay, (2002). Physiological Aspects of Sports Training Performance, Champaign Illinois: Human Kinetics Publishers Inc.
10. Lee E. Brown, et al., (2000), Training for speed, Agility and Quickness, Champaign Illinois: Human Kinetics Publishers Inc.
11. Ted A. Baumgartner, and Andrew S. Jackson, (1991), Measurement for Evaluation in Physical Education and Exercise Science, U.S.A.: W.M.C. Brown Publishers.
12. Thomas R., Baechle (1994), Essentials of Strength Training and Conditioning, Champaign Illinois: Human Kinetics Publishers Inc.
13. Tudor O. Bomba, (1999). Periodization: Theory and Methodology of Training, (4th ED), Champaign Illinois: Human Kinetics Publishers Inc.
14. Tudor O. Bomba. and, Coracchia, Lorenzo (1998), Serious Strength Training, Champaign Illinois: Human Kinetics Publishers Inc.
15. Wilf Paish (1991).The Complete Manual of Sports Science. London: A & C Black Ltd.
16. William J. Kraemer and Steven J. Fleck (1993). Strength Training for Young Athletes, Champaign Illinois: Human Kinetics Publishers Inc.

ATHLETIC CARE AND REHABILITATION (ACR)

Unit: I Introduction

- 1.1 Meaning and Definition of related Terminology
 - i) Athlete: Health, Fitness, Wellness and life – style & sports performance
 - ii) Care: Before, during and after completion
 - iii) Rehabilitation Aims, Objectives and Principles
- 1.2 Scope, Objectives and Importance of ACR
- 1.3 Need of ACR for Physical Education Professional
- 1.4 Role of Physical Education Professional in ACR
- 1.5 Historical Development and marks / IOC / IOA

Unit: II Injuries and Preventive/Safety Measures

- 2.1 Introduction, meaning, Definition & Terminologies used in sports Injuries (Macro – trauma, Acute – Chronic, Major – Minor, Soft tissue – Hard tissue, Mild, Moderate & severe)
- 2.2 Head to Toe Injuries, Sports Specific Injuries, and Common Injuries
- 2.3 Reasons, Causes, Types and Classification of Sports Injuries
- 2.4 Early Diagnosis, Treatment & Management of Sports Injuries
- 2.5 Prevention and Safety Measures

Unit: III Doping in Sports (Drug Abuse) Ergogenic Aid and Sports Performance

- 3.1 Definition, Meaning, and classes of banned drugs in sports
- 3.2 Side effects of banned drugs in sports
- 3.3 Detection of doping and sanction against offenders
- 3.4 Meaning, Definition of Ergogenic Aids in Sports
- 3.5 Types, Advantages, Risk Associated with use of Ergogenic Aid.

Unit: IV Women and Sports Performance

- 4.1 Introduction to Women & Sports Performance
- 4.2 Physical & Physiological, Bio – Chemical and Bio- mechanical difference between men and women
- 4.3 Training and suitability of sports at various stages of life
- 4.4 Premenstrual syndrome, Amenorrhoea, and Sports performance aging, and Sports Performance
- 4.5 Female Athlete Triad, Eating Disorder, Osteoporosis and Inactivity, Exercise benefits in old age.

Unit: V Environment Effect on Sports Performance (Children and Old Age in Sports)

- 5.1 Introduction, Meaning, Types of Environmental conditions
- 5.2 Training in Different Temperature (Hot and Cold Environment Conditions)
- 5.3 Medical Problems, Symptoms, Treatment and acclimatization in different Temperature & altitude / Pressure
- 5.4 Introduction: Effect of Chronological & biological age in Sports
- 5.5 Training Implication, Precautions, Peak performance
Practical

Practical - Demonstration and use of therapeutic modalities

- i) Cryotherapy (Ice Therapy)
- ii) Hydrotherapy (Water Therapy)
- iii) Thermo therapy (Hot & Cold)
- iv) Electrotherapy (Tens, Ultrasound short wave Diathermy)
2. Treatment and Management of Common Injuries
 - i) Soft Tissue Injuries
 - ii) Bone Injuries
 - iii) Joint Injuries
3. Rehabilitation / Therapeutic Exercises
4. Massage – Sports Performance
 - i) Relaxation Massage
 - ii) Muscle Tone Management using massage
 - iii) Massage for faster recovery from fatigue
 - iv) Sports Specific massage
 - v) Rehabilitative massage etc.
5. Visit to Rehabilitation Centres
6. Research and Practice Review of ACR.

References

1. Armstrong & Tucker “Injuries and Sports” Lindon Scauples Press
2. Carol C. Teitz, M.D. Scientific Foundations of Sports Medicine, 1993, B.C. Decker Inc
3. Domhnall Macauley, Sports Medicine Practicla Guidelines for Genreal Pracive, 2001 Butterworth Heinemann
4. Joseph Ruten franz, Rolf Mocellin, and Fedinand klimt, Children and Exercise XII 1993, Human Kinetics Publishers.
5. Josephs Torg, Athletic Injuries to the Head, Neck and face, 1995, Lee & Febiger
6. Mark Harries, Clyde Williams, William D, Dtanish and Lyle J. Micheli, Oxford Textbook of Sports Medicine, 1997, Mark Harries
7. Maughan, The Encyclopaedia of Sports Medicine Nutrition is Sports 2001
8. More House & Rash “ Sports Medicine for Trainer” HB Sounders
9. Pande P.K & Gupta L.C. Outline of Sports Medine (1990) Jaypee Brother, Delhi
10. Pfeiffer & Mangus, concepts of Athletic Training, 2000 Pfeiffer, Ronald P.
11. R.J.Maughan, Basic and Applied Sciences for Sports Medicine, 1999, Butterworth Heinemann
12. Ryan J. Allan & Alhman J.L Fred (1989) Edited Sports Medicine Academic Press, INC san Diego California
13. Shaw, Dhanajoy and Gambhir, Shalini Encyclopaedia of Sports Injuries and Indian Sports persons Delhi, Khel Sahitya Kendra, 2000
14. Shaw, Dhananjay and Tomar, Rakesh Doctoral Research in Physical Education and its Sciences in Development Countries, Delhi: Khel Sahitya Kendra, 2000
15. Steven Roy, Irvin Richar”Sports Medicine” (1983) Prentice Hall
16. Steven Roy, Richard Irvin, sports medicine prevention, Evaluation, management and Rehabilitation, 1999, Roy Steven, Sports Medicine for the Athletic trainer
17. Singh, M.K. Indian Women & Sports (1990) Rawat Publications, Jaipur
18. Vijay, Handbook of Sports Medicine, 2001 Mrs. Sushil Gosain

19. Wade A. Liggegard, Janus D. Butcher, Kasen S. Ruckjer, Handbook of Sport Medicine, Second Butterworth Heinemann, www.bh.com
20. Wells L. Christine, (1991) Women, Sports & Performance, A Physiological perspective Human kinetics publishers, Inc Champaign
21. Willian, J.G.P. "Sports Medicine" London Edwar Arnold Publisher.

SPORTS NUTRITION

Unit: I Fundamentals of Nutrition:

Meaning – Need: Digestion (Gastro Intestinal tract function) – Absorption (Assorptive Mechanism, Absorption of the Nutrients, Intestinal Micro Flora, Lymphatic System) – Circulation of Nutrients – Inadequate Nutrition and Disease

Unit: II Classification of Nutrition

Micro – Macro – Carbohydrates: Functions, Types, Requirements, Food Sources – Proteins: Function, Types, Requirements – Food Sources – Fats: Function, Types, Requirements- Food Sources – Vitamins: P Functions, Types, Requirements, Food Sources – Minerals: Functions, Types, Requirements, Food Sources – Water : Functions, Requirements – Dehydration – Food Strakes of Water Contents.

Unit: III Nutritive Value

Some common food preparation (per serving) – Nutritive and Caloric values of foods: Cereal and millet preparations and its caloric calues, pulse preparations and its caloric values, vegetable preparations and its caloric values preparations containing milk and its caloric values, egg, fish and meat preparations and its caloric values.

Unit: IV Energy Requirements

Assessment of Energy Intake (Hunger, Appetite, and Satiety) – Calories – Dietary Intakes – Caloric Density Foods – Assessment of Energy Expenditure: Body Calorimetric – Components of Energy Expenditure – Basal and Resting Metabolism Thermic Effect of Food – Thermic Effect of Exercise – Estimating Energy Expenditure – Expenditure of Energy in various Types of Activities (Running, Cycling Gymnastics, Volleyball Cricket, Tennis, Football, Swimming and Cross Country Running)

Unit: V Diets for Athletes

Recommended Dietary Composition for Athletes (Daily Dietary Intakes Esaddis) – Dietary Reference Intakes – Meal Composition and Athletic Performance – pre Competition Diet – During Competition (Fluid Requirements during Exercise) and Post Competition Diets – Food Guide Pyramid – Supplementation of Foods.

References:

1. Covert Bailey, (1984), “The Fit-or-Fat Targhet Diet” Printed in USA.
2. David. F.Tver, pery Ruseell, (1981), The Nutrition and Health Encyclopedia” Van Nostrand Reinhold Company, New York.
3. Dr. D.C.Lal(2006), “Health and Nutrition” Sports publication, Darya Gang, New Delhi
4. Frank G. Addleman(1984), “The Winning Edge Nutrition for Athletics Fitness and Performance” Prentice – Hall. Inc, Engle Wood Cliff, New Jercy.
5. Jean Carper, (1988) “The Food Pharmacy Dramatic New Evidence that Food is your Best Medicine” Harper and Row Publishers Inc.
6. Judy A.Driskell, (2000), “Sports Nutrition” CRC Press LLC, N.W.Corporate Blvd, Boca Raton, Florida 33431

7. L.Jean. Bogert, George.M.Briggs, Doris Hows Calloway,(1966), “Nutrition and Physical Fitness”Eighty Edition, W.B.Saunders Company
8. Mark Bricklin, Sharon Stocker, (1992), “The Natural Healing and Nutrition Annual 1992, Rodale Press.Inc
9. Reema Kirtani(2002), “A-Z Hand Book of Diet and Exercise, Khel Sahitya Kendra, New Delhi.
10. Seema Yadav, (1997) “Text Book of Nutrition and Health” Anmol Publications Pvt.Ltd.
New Delhi

SPORTS MANAGEMENT

Unit: I

Fundamental Concepts of Sports Management

- 1.1 Definition, evolution & curriculum
- 1.2 Career considerations & avenues & professional preparation
- 1.3 Research Theory & Practice
- 1.4 Aims, Objectives & Principles of Sports Management
- 1.5 Who are Sports Managers? Job Specifications, and environment

Unit: II

The World of Sports Management

- 2.1 International Perspective in Sports Management: Asia (China, Korea & India)
Australia, Africa, America (Canada, USA), Europe (France, Hungary, Netherlands, Germany, Spain)
- 2.2 Management Approaches: Classical, Behavioural, Systems, Contingencies Management Science
- 2.3 Management Styles: The Autocratic, The Bureaucratic, The Democratic & The Spectator Style
- 2.4 Management Information System (MIS)
- 2.5 Media & Sports Management, Public Relations, Communications

Unit: III

Event Management

- 3.1 Basic Principles & Planning (Organizing, Directing & Evaluating)
- 3.2 Facilities, Equipments, Personnel / Committee & Leadership, Creating & Maintaining Motivation
- 3.3 Promotion & Marketing (Budget Considerations & Risk Management)
- 3.4 Applied Concepts: Evaluation & Feedback Protocol of Ceremonies, Websites, Marketing Process, Public Relations- Publicity and advertisement
- 3.5 Control & Security: Violent Behavior, Crowd Management, Alcohol Policy, Medical Plan, Crisis Management & Evaluation Plan, Parking & Traffic Control

Unit: IV

Facilities & Equipment Management

- 1.1 Sports Facilities Equipment & Ancillaries Areas
- 1.2 Fitness & Health Relation Areas
- 1.3 Aquatic & Indoor Facilities
- 1.4 Outdoor & Adventure Sports
- 1.5 Facilities for Senior, and Special Population

Unit: V

Fiscal Management & Applied Areas

- 5.1 Definition & Role of Accounting in sports Management

- 5.2 Fund Raising, Sponsorships, Economic Resources
- 5.3 Budgeting: Preparation, Presentations, and Revision etc.
- 5.4 Office Management: Record, Reports, time management, conflict resolutions, decision taking shared planning Identifying weaknesses & strength
- 5.5 Preventing legal Issues & Hassels

References:

1. Aggarwala vira. Bharna (1992) Management Principles, Practices, Techniques II Edition (Deep & Deep Publications – New Delhi)
2. Chelladurai P (1985) Sports Management Macr – Perspectives (Adelaide St. London Ontario)
3. Davis, Kathleen. A.Sports Management: Successful Private Sector Business Strategies USA: WCB Inc.
4. Goel. S.L., (1995) Modern Management Techniques (Deep & Deep Publications – New Delhi)
5. Parkhouse, Bonniw (1991) The Management of Sports: Its foundation and Application. St. Louis Mosby – Year Book Inc.
6. Plunkett, Richard.W.Supervision(1991) The Direction of People at Work. USA: Allyn and Bacon Inc.
7. Sandhu, Kiran (1995) Sports Dynamic: Psychology, Sociology and Management . Galgotia publication: New Delhi
8. Walker, Marcia, L. and Stortar, David K.(199) Sports Facility Management . London: Jones and Barlett Publishers

ADAPTED PHYSICAL EDUCATION AND SPORTS

Unit – I

Definition and meaning of the term adapted physical education – scope of the adapted physical education – disability – handicap – impaired – multiple disabilities – rehabilitation – special education – inclusive education – classification of disability – blind – deaf – dumb – orthopedically handicapped – Mentally retarded and Learning disability. Quality and qualification of teachers of adapted physical education

Unit – II

Programme planning and suggested physical activities for motor development of the children with visual impairments – Deaf and Dumb – Learning disabilities – Orthopedically handicapped

Unit – III

Application of the yogic practices of asanas, pranayama – bhandhas - mudras – kriyas – meditation for the development of physical, mental, moral, social and spiritual of the mentally retarded person – visually handicapped person – deaf and dumb person – orthopedically handicapped persons

Unit – IV

Adapted games for Disabled: modification of the rules of the game, special needs – alternation of the activity area – creativity – co-operative games – method of communication of the following games: Tennis – Basketball Football – Volleyball.

Unit – V

Perceptual – Motor Development of the disabled children – physical activities for the students with temporary disabilities and other special conditions. Individual, dual and adventure sports and activities – Postural evaluation – test of physical fitness – tests for orthopedically and sensory impaired children – tests for mentally retarded children – tests for muscular endurance and strength – test for flexibility – test for cardio – respiratory endurance – tests for body composition.

Reference

1. Clading and sherill adapted physical education and recreation IOWA
2. Anoop Jain Adapted physical education Sports Publication 2003

3. Yogic Therapy – its Basic Principles and Methods – by Swami Kuvalayananda and Dr.S.Lvinekar. Ministry of Health, Govt., of India, New Delhi,1963
4. Asanas – By Swami Kuvalayananda. Kaivayadhama, Lonavia,
5. Pranayama by Swami Kuvalayananda. Kaivayadhamam, Lonavala.Science Studies Yoga – A Review of Physiological
6. James Funderburk. Himalayan International Institute of Yoga science and Philosophy of USA, Illinois, 1977.
7. Collected papers on yoga – edited by Swami Digambarii, Kaivalyadhamam.

SPORTS ENGINEERING

UNIT I INTRODUCTION

Materials in sports- Factors determining sports performance, materials, processing and design in the pole vault, relationship between materials technology and design-fencing masks, foam production in sport- static foam protection products, soccer shin and ankle protectors, rigid foam protection for sports wear- cycle helmets,

UNIT II SURFACE ENGINEERING IN SPORT

Introduction, measurement of surface performance, sports specific surfaces, future developments, Surface properties and surface engineering, surface coating, surface modification, surface engineering case studies,

UNIT III MATERIALS FOR TENNIS STRING AND RACKETS

Introduction, string types, function of string in a racquet, frame stiffness, quasi-static stretch tests, energy loss in a string, perception of string properties, measurements of tension loss and dynamic stiffness, tension loss results, impact dynamics, coefficient of friction, oblique impacts on tennis strings, Influence of materials on racket technology, frame materials, materials for accessories and special parts, current manufacturing process, design criteria, future trends

UNIT IV MATERIALS IN BICYCLES AND MOUNTAINEERING

Introduction, WOODEN BIKES, materials properties, materials properties, failure by fatigue, bike failures-some case studies, pedal cycle injury statistics, exploding wheel rim, consumer protection act, Introduction, ropes, harnesses and slingskarabiners, belay, descending and ascending devices, rock protection, ice climbing equipment, helmets, future trends, and materials in golf.

UNIT V SHOE MATERIALS AND AERODYNAMIC PRINCIPLES

Introduction, running shoe materials, shoe construction, shoe foam, stress analysis, foam durability . Basic aerodynamic principles- cricket, baseball, tennis, golf, soccer/volleyball, boomerang, discus, javelin, future trends.

Reference

1. Mike Jenkins, Aleksandar Subic, “Materials in sports equipment” published by Woodhead publishing.
2. John Mongillo, “Nano Technology 101 ” Green wood publishing group.

RESEARCH METHODOLOGY

Objectives

Scholar able to:

1. Know the concepts of research problem
2. Know the aspects of descriptive and experimental research
3. Know the various sampling techniques used in the research

Unit I : Location and Selection of Problem: Examining Assumptions, Anticipating the Outcome of Inquiry, Types of Research - Basic, Applied and Action research - Major approaches: Normative, Functional, Dialectical, Critical Evaluation and Synthesis - Content Analysis: Longitudinal Study, Cross Sectional Study, Quasi experimental, placebo design - Trends Report - Hybrid Study of Cross-sectional and longitudinal Study

Unit –II Descriptive research: Nature and Scope of Descriptive Research Criteria: Areas and levels - Construction of Theoretical Frame Work, Formulation of Research Design, Survey Studies - Planning and Conducting Interviews – Observation Studies. Item Analysis, Content Analysis, Projective Technique, Scaling Technique - Analysis and Presentation of Information Assessment and Evaluation of Descriptive Research

Unit - III Design and Sampling

An introduction to Ex-post Facto and Experimental Research, Laboratory Experiment and Field Experiment - Experimental and Ex-post Facto Research as Differentiated from other types of researches

Post test only design

Pre Test and Post Test Design for Single Group

Pre Test and Post Test Design for Multi-group

Repeated Measure Design for Single group

Repeated Measure Design for Multi group

Matched Group Design for Post Test Only

Matched Group Design for Pre and Post-Test

Matched Group Design for Pre and Post Test for Multiple Group

Sampling: Characteristics, Principles, criteria for selection, types of sampling techniques: probability and non-probability sampling.

Unit – IV Experimental Research

Test Construction and Selection in Experimental Research - Relationships and Comparative Studies in Experimental Research - Control of Experimental Variables /groups, Control Groups and Factors Affecting Experimental Outcome - Establishing the Various Types of Experimental Research Laboratory in relation to the sports field & facilities.

Unit –V Mechanics

Theory, Ethics and Politics in Research of Physical Education with special reference to Experimental Research - Mechanics of report writing – recent research in inter and multidisciplinary – plagiarism – H index – impact factor – citation - submitting the proposal to the funding agencies.

Practical:

1. Preparation of Various Experimental Design
2. Measuring of the Various Variables: Physical, Physiological, Biomechanics and Psychological etc.
3. Collection and deal with data and scoring

Learning Outcomes:

Scholar able to

1. Plan the formation and development of research problem
2. Use the descriptive research methods
3. Understand the concepts of experimental research
4. Know the tools used in the research

References:

1. David H. Clarke and H. Harrison Clarke, (1970), *Research Process in Physical Education* (2ED), New Jersey, Englewood Cliffs, Prentice-Hall, INC. ISBN:0137745133.
2. Fruederick, L. (1950), *The Elements of Research*, New York, Prentice Hall, Californi.
3. Garret E. Harry and Woodworth N.S. (1958), *Statistics in Psychology and Education*, Bombay Allied Publications Private Ltd.
4. Jerry R. Thomas and Jack K. Nelson, (1996), *Research Methods in Physical Activity* (3 ED), Human kinetics, ISBN-0880114819.
5. Jerry R. Thomas and Jack K. Nelson, (2005), *Research Methods in Physical Activity* (4 ED), Human kinetics, ISBN-13: 978-0736036924, ISBN-10: 073603692X
6. Jerry R. Thomas, Jack K. Nelson and Stephen J. Silverman, (2015), *Research Methods in Physical Activity* (7 ED), Human kinetics, ISBN-13: 9781450470445.
7. John W Best & James V. Kahn, (1992), *Research in Education*, New Jersey, Prentice Hall Inc.
8. Kothari C.K. (1993), *Research Methodology Methods and Techniques*, New Delhi; Wiley Eastern Ltd.
9. Manilal K.P. and Lakshmeesha. Y.S. (2003), *Writing Thesis Format & Style for Physical Education and Sports Sciences*, Bangalore, Adprints & Publishers.
10. Tuckman. B.W., (1999), *Conducting Educational Research*, (5ED), Orlando, Harcourt Brace Publishers.

11. William A.Pitney and Jenny Parker, (2009), Qualitative Research in Physical Activity and the Health Professions, Human kinetics, ISBN-13: 9780736085441.

Journals:

1. Educational Action Research
2. Educational Researcher
3. Heart & Lung: The Journal of Acute and Critical Care
4. International Journal of Qualitative Methods
5. International Journal of Qualitative Studies in Education

Website:

1. <https://explorable.com/research-methodology>
2. <http://study.com/academy/lesson/research-methodology-approaches-techniques-quiz.html>
3. https://www.slideshare.net/sh_neha252/research-methodology-4821125

SPORTS STATISTICS

Unit –I Statistical Concepts – Statistics – types of Statistics – Scale of Measurements - data – normality of data – normal curve - type I ,II, III & IV errors - Level of significance

Unit II Parametric Techniques

Assumptions underlying factors in Parametric Techniques - Normality and homogeneity of variance - Relationships among Variables - Understanding the Nature of Correlation - Coefficient of Correlation - Correlation Research - Using Correlation for Prediction - Partial Correlation - Uses of Semipartial Correlation - Procedures for Multiple Regression Differences Among Groups

Unit III- Statistics Test Differences - Three Types of t Tests - Interpreting t - Relationship of t and r - Declaring Two Groups Equivalent - Analysis of Variance - Analysis of Covariance - Understanding Multivariate Techniques - Discriminant Analysis - Multivariate Analysis of Variance - Multivariate Analysis of Covariance - Repeated Measures With Multiple Dependent Variables - Canonical Correlation - Factor Analysis Structural Modeling

Unit IV- Nonparametric Techniques

Chi-Square - Mann-Whitney U Test - Wilcoxon Matched- Pairs Signed - Ranks Test - Kruskal-wallis ANOVA by Ranks - Friedman Two-Way ANOVA by Ranks - Spearman Rank-Difference Correlation.

Unit V – Development of Norms

Percentile scale – Standard scale (Z, 6 sigma, Hull and T scale)

Practical

1. Knowledge of SPSS and Micro Stat applications
2. Knowledge of statistical work out in Excel sheet

References:

1. Broota K.D. (1989), Behavioural Research, New Delhi; Wiley Eastern Limited, ISBN:8122402151.
2. David H Clarke and Clarke H Harrison.(1972), Advanced Statistics, New Jersey, Prentice Hall Inc.
3. Harry E. Garre, (1958), Statistics in Psychology and Education, Bombay: Allied Private Ltd.
4. Jerry R.Thomas and Jack K.Nelson, (1996), Research Methods in Physical Activity (3 ED), Human kinetics, ISBN-0880114819.
5. Jim Albert, Mark E.Glickman, Tim B.Swartz and Ruud H.Koning, (2016), Handbook of Statistical Methods and Analyses in Sports, Chapman and Hall/CRC.
6. Neilson N.P. (1960), An Elementary course in Statistics Test and Measurements in

Physical Tests, Polo Alto, California.

7. Thomas A. Severini, (2014), Analytic Methods in Sports: Using Mathematics and Statistics to Understand Data from Baseball, Football, Basketball, and Other Sports, Chapman and Hall/CRC.
8. Verma J.Prakash, (2000), A Text Book on Sports Statistics, Gwalior, Venus Publication, ISBN:81876450302.