

School of Sports Sciences

Department of Sports Biosciences



Proposed Course Structure and Course Details

M.Sc. Sports Physiology

Central University of Rajasthan NH-8,
Bandar Sindri, Kishangarh-305817 Dist.
– Ajmer (Rajasthan)

M.Sc. Sports Physiology

SEMESTER I (Total credits: 24)

Code	Title of Course	Type of Course	Credits
MSSP 101	Human Anatomy and Physiology	Core	3
MSSP 102	Biomolecules and Metabolism	Core	3
MSSP 103	Kinesiology	Core	3
MSSP 104	Psychological and Social Aspects of Sports	Core	3
MSSP 105	Biomechanics and Motor Learning	Core	3
MSSP 106	Elective I <ul style="list-style-type: none"> • Elective from any other Department • Sports First Aid and Emergencies • History of Physical Education and Sports • Physiological Aspects of Ageing 	Elective	3
MSSP 107	Laboratory I	Core	3
MSSP 108	Laboratory II	Core	3

SEMESTER II (Total credits: 24)

Code	Title of Course	Type of Course	Credits
MSSP 201	Principles and Methods of Sports Training	Core	3
MSSP 202	Performance Evaluation and Testing	Core	3
MSSP 203	Fatigue, Injuries and Rehabilitation	Core	3
MSSP 204	Food and Nutrition	Core	3
MSSP 205	Statistics for Sports Science	Core	3
MSSP 206	Elective II <ul style="list-style-type: none"> • Elective from any other Department • Kinanthropometry in Sports • Health Fitness and Wellness • Adaptations to Exercise and Training 	Elective	3
MSSP 207	Laboratory III	Core	3
MSSP 208	Laboratory IV	Core	3

SEMESTER III (Total credits: 24)

Code	Title of Course	Type of Course	Credits
MSSP 301	Physiology of Sports and Exercise	Core	3
MSSP 302	Sports Ergonomics and Ergogenic Aids	Core	3
MSSP 303	Fitness Assessment and Exercise Prescription	Core	3
MSSP 304	Neuroscience and Endocrinology in Sports	Core	3
MSSP 305	Physiological Support for Athletes	Core	3
MSSP 306	Elective III <ul style="list-style-type: none"> • Elective from any other Department • Drugs and Doping in Sports • Sports Genetics and Performance • Exercise Immunology 	Elective	3
MSSP 307	Laboratory V	Core	3
MSSP 308	Laboratory VI	Core	3

SEMESTER IV (Total credits: 24)

Code	Title of Course	Type of Course	Credits
MSSP 401	Research Methodology	Core	3
MSSP 402	Journal Club Presentation	Presentation	3
MSSP 403	Major Project	Tutorial/Laboratory	18

SEMESTER-I

MSSP 101

Human Anatomy and Physiology

Credit 3

Unit-I

Anatomy and Physiology of: Blood, Cardiovascular System, Lymphatic System, Integumentary System and Respiratory System.

Unit-II

Anatomy and Physiology of: Nervous System, Special Senses, Endocrine System, Skeletal System, Joints and Muscular System.

Unit-III

Anatomy and Physiology of: Digestive System, Immune System, Urinary System, Fluid and Electrolyte Balance, Reproductive System, Pregnancy and Human Development.

Recommended Books:

- Human Anatomy and Physiology (10th edition) by Elaine N Marieb, Katja N Hoehn.
- Introduction to Human Body- The Essentials of Anatomy and Physiology by Gerard J. Tortora.
- Textbook of Anatomy with Coloured Atlas by Inderbir Singh.
- Textbook of Medical Physiology by Arthur C. Guyton.
- Principle of Human Anatomy (10th Edition) by Gerard J. Tortora.
- Gray's Anatomy: Anatomical Basis of Clinical Practice by Standring, Susan. Borley, Neil R. Gray Henry.
- Human Physiology by C.C. Chatterjee.
- Chowdhary Medical Physiology by S K Chowdhary.
- Netter's Atlas of Human Anatomy by Frank H. Netter.

MSSP 102

Biomolecules and Metabolism

Credit 3

Unit-I

Foundation of Biochemistry, Properties of Water, Amino Acids, Peptides and Proteins, Structure and Function of Proteins, Enzymes, Sugars, Carbohydrates and Glycobiology, Nucleotides and Nucleic Acids, Fatty Acids, Structure and Functions of Lipids.

Unit-II

Principles of Bioenergetics, Major Metabolic Pathways in Human and its Relevance with Exercise, Glycolysis, Gluconeogenesis, Pentose Phosphate Pathway, Citric Acid Cycle, Electron Transfer System in Mitochondria, Oxidative Phosphorylation.

Unit-III

Basic Concepts and Design of Metabolism, Metabolic Regulation of Glucose and Glycogen, Biosynthesis of Carbohydrates, Lipid Biosynthesis, Fatty Acids Catabolism, Amino Acids- Biosynthesis, Oxidation and Production of Urea, Metabolism of Lactate, Integration and Regulation of Metabolism.

Recommended Books:

- Principles of Biochemistry- Lehninger Nilson and Cox W.H. Freeman.
- Principles of Biochemistry- Donald Voet, CW Pratt, JG Voet (2012) Wiley, ISBN:1118092449.
- Principles of Exercise Biochemistry Editor(s): Poortmans J.R. (Brussels) Karger Publishers.
- Biochemistry JM Berg, TL Tymoczko L Stryer W. H. Freeman and Company.
- West & Todd Text book of Biochemistry. Mac Millan Company London.
- G.P. Talwar & ID Singh Textbook of Biochemistry & Human Biology - Prentice Hall of India, New Delhi.
- Vasudevan Textbook of Biochemistry. Jaypee Brothers Medical publishers (P) Ltd.
- Jain J.L., Jain Sanjay, Jain Nitin, S Fundamentals of Biochemistry -. Chand and Company Ltd, New Delhi.
- A.C. Dev. Comprehensive Viva and practical Biochemistry. New Central Book Agency Pvt. Ltd.

MSSP 103

Kinesiology

Credit 3

Unit-I

Meaning of Kinesiology, Aims and Objectives of Kinesiology, Role of Kinesiology in Sports; Anatomical Position, Principles of Plane and Axis, Various types of movements.

Unit-II

Bones: Meaning and composition of bone, Kinds of bones (flat, long, short, irregular and sesamoid), Function of bones, Bone fracture and its types; General features of the following bones: Upper Extremities: Clavicle, Scapula, Radius and Ulna, Humorous; Lower Extremities: Femur, Patella, Tibia, Fibula, Pelvic Bones; Joints: Meaning and types of joints, Joint flexibility, Technique to

increase the flexibilities, Structure, function, fundamental movements around the joints; General features, structure and movements of the following joints: Shoulder Complex, Elbow Complex, Hip Complex, Knee joint, Spinal column and Pelvic girdle.

Unit-III

Introduction to Muscular System: Muscles and Tendons, Classification of muscles, Structure of Skelton muscle, classification of muscles on basis of fibre arrangement, Physiology of muscle contraction, types of muscle contraction, Role of muscle in movement, Methods of studying the action of muscle. Origin, Insertion and action of major muscle groups of the Body; Nervous System: Overview of Nervous system, Neurons, Motor Unit and Receptors.

Recommended Books:

- Clinical Mechanics and Kinesiology with web Resource, Human Kinetics, by Janice Loudon, Robert Manske, Michael Reiman.
- Biomechanics and Kinesiology of Exercise – 2013 by Michael Yessis.
- Cynthia C. Norkin, Pamela K. Levangie : Joint structure & function- A comprehensive analysis 2nd edition.
- Brunnstrom - Clinical Kinesiology, F.A. Davis.
- Rasch and Burk: Kinesiology and Applied Anatomy, Lee and Fabiger.
- Shaw, D., Pedagogic Kinesiology, Khel Sahitya Kendra, 2007.
- Thompson, C., Manual of Structural Kinesiology. (10th Ed.), St. Louis: Times Mirror/ Mosby College Publishing, 1995.
- Shaw, Dhanonjoy, Kinsiology and Biomechanics of Human Motion, Khel Sahitya Kendra, 1998.
- White and Punjabi - Biomechanics of Spine - Lippincott.
- Kapandji: Physiology of Joints Vol. I, II & III, W.B. Saunders.
- Luttgens K., Hamilton N.: Kinesiology – Scientific Basis of Human Motion 9th Edi.
- Basic Biomechanics 4th edition, susan J. Hall, MCGraw Hill.

MSSP 104

Psychological and Social Aspects of Sports

Credit 3

Unit-I

Sports Psychology and role of Psychology in Sports, Methods of Psychology employed in Sports, Motor leaning and Performance, Importance of Sports Psychology for Athletes, Coaches and others related to sports settings.

Unit-II

Personality and its role in Sports, Attention and Perception in Sports; Motivation and Goal setting and its role in Sports, Emotions in Sports, Stress and Anxiety in Sports, Biofeedback techniques in Sports.

Unit-III

Sociology of Sports, Social Factors and Socio-metric techniques in Sports, Group processes, Team cohesiveness and Leadership in sports, Effect of crowd behaviour in Sports, Economics and Politics in Sports.

Recommended Books:

- Weinberg & Gould, Foundations of Sports and Exercise Psychology. Human Kinetics 2016.
- Motor Learning and Performance 5th Edition With Web Study Guide From Principles to Application, Human Kinetics by Richard Schmidt, Tim Lee.
- Morgan and King: Introduction to Psychology - Tata McGraw Hill.
- M.L. Kamlesh Psychology in Physical Education and Sports by Mehopolitan book co. Pvt. Ltd., Netaji Subash Marg, New Delhi 11002.
- Sanjeev. P. Sahni Psychology and its application in sports by D.V.S. publications, 100, Giri Nagar Kalkaji, New Delhi-110019.
- Agyajit Singh Psychology of Coaching by Friends Publications, # 101 Ansari Road Darya Ganj, New Delhi-110002.
- Jitendra Mohan Recent Advances in Sports psychology, By, Publisher, Friends Publications.
- Fundamentals of Sociology of Sport and Physical Activity, Human Kinetics by Katherine M. Jamieson, Maureen M. Smith.
- Doing Exercise Psychology, Human Kinetics by Mark Andersen, Stephanie Hanrahan.
- Social Issues in Sport 3rd Edition, Human Kinetics by Ron Woods.

MSSP 105

Biomechanics and Motor Learning

Credit 3

Unit-I

Role of Bio–Mechanics in the Field of Sports Science, Principles of Biomechanics; Biomechanical Concepts: Motion, Newton's law of Angular Motion and Linear Motion and its relationships, Force, Centripetal and Centrifugal forces, Equilibrium, Centre of Gravity and Stability, Freely falling bodies and Projectile, Momentum, Impulse, Lever and its Classification, Work, Power, Energy: Relationship of Work, Power and Energy, Friction, Spin, Impact, Elasticity, Rebound, Fluid Mechanics, Air Resistance and Water Resistance.

Unit-II

Determine the simultaneous-sequential nature of a variety of movement skills, Classify motor skills using the classification system presented, .Bio-Mechanical analysis of fundamental skills: Walking, Running, Jumping, Pulling, Pushing, Lifting, Lowering, Throwing.

Unit-III

Introduction to Gait Analysis. Mechanical Analysis of Sports Skills: Athletics (Running, Jumping and Throwing), Swimming, Football, Basketball, Volleyball, Cricket. Technological Use and Advances in Biomechanics: Techniques and Tools for Measurement of Biomechanical Variables.

Recommended Books:

- Biomechanical Analysis of Fundamental Human Movements by Arthur Chapman, 2008, Human Kinetics.
- Biomechanics of Sport and Exercise 3rd Edition With Web Resource and MaxTRAQ 2D Educational Software Access- Loose-Leaf Edition, Human Kinetics, By Peter McGinnis.
- Biomechanics and Kinesiology of Exercise – 2013 by Michael Yessis.
- Cynthia C. Norkin, Pamela K. Levangie : Joint structure & function- A comprehensive analysis 2nd edition, F.A. Davis Company Philadelphia.
- Brunnstrom - Clinical Kinesiology, F.A. Davis.
- Rasch and Burk: Kinesiology and Applied Anatomy, Lee and Fabiger.
- White and Punjabi - Biomechanics of Spine - Lippincott.
- Kapandji: Physiology of Joints Vol. I, II & III, W.B. Saunders.
- Luttgens K., Hamilton N.: Kinesiology – Scientific Basis of Human Motion 9th Edi.
- Basic Biomechanics 4th edition, susan J. Hall, MCGraw Hill.
- Joseph Hamill, Kathleen M. Knutzen. Biomechanical Basis of Human Movement.

MSSP 106

Elective I

Credit 3

Sports First Aid & Emergencies

Unit-I

Introduction to Sports First Aid, Athletic Health Care Team, Sport First Aid Game Plan, First Aid Equipment and Kit, Basic Life Support System: Recovery Position, Head to toe- survey, Artificial Ventilation; Basic Sport First Aid Skills : Anatomy and Sport Injury Terminology , Emergency Action Steps , Physical Assessment and First Aid Techniques , Moving Injured or Sick Athletes.

Unit-II

Sport First Aid for Specific Injuries: Unconsciousness: ABC, CPR, AED, Respiratory Emergencies and Illnesses, Shock, Wounds and Bleeding, Head, Spine and Nerve Injuries, Internal Organ Injuries, Upper Body and Lower Body Musculoskeletal Injuries, Facial and Scalp Injuries, Skin Problems.

Unit-III

Disaster Preparedness and Management: Weather-Related Problems, Environmental Emergencies: Animal Bites and Stings, Allergies, First Aid Protocols, Practical Skills in using: Triangular Bandages, Broad fold, Thin fold, Slings, Collars, Cardiac Emergencies.

Recommended Books:

- Sport First Aid-5th Edition by Melinda Flegel, Human Kinetics, 2014.
- American Red Cross, First Aid/CPR/AED : PARTICIPANT'S MANUAL.
- Practical First Aid: British Red Cross in Association with Donning Kinder Sley.
- John Morris: First Aid Training Manual, Everyday learning Pvt. Ltd.
- Authorized Manual of St. John Ambulance (India): First Aid.
- Bradley R.A. Wilson. Timothy E. Glaros : Managing Health Promotion Programs Human Kinetics Publishers.

History of Physical Education and Sports

Unit-I

What are Play, Game and Sports? Types of sports and recreational activities, Importance of free play and organizational games, Terminology of Sports Science and Physical Education, Health related and Motor performance related fitness, Health and Wellness (Physical, Mental, Psychological, Social and Spiritual) and Athletics, Sports Carriers: Media, Management, Performance, Coaching and other related areas.

Unit-II

Philosophy and its need in Sports and Physical Education, Idealism, Naturalism and Pragmatism in Physical Education, Physical Education in Ancient Greek, Rome, India and Modern India. History of Olympic Games, Asian Games, SAARC Games and SAF Games, National Sports Awards, trends and problems in Sports Sciences and Physical Education in 21st Century

Unit-III

Introduction to general Rules and Regulations of Selected Sports (Football, Field Hockey, Basketball, Volleyball, Cricket Badminton and Tennis), Introduction to Playfields and Track Specifications, General organizational process of Sports Competitions.

Recommended Books:

- Bucher, C.A.: Foundation of Physical Education, St. Louis: The C.V. Mosby company, 1983.
- History and Philosophy of Sport and Physical Activity, Human Kinetics by R. Scott Kretchmar, Mark Dyreson, Matthew Liewellyn, John Gleaves, 2017.
- Synder and Geoh: Professional preparation in Health Education, Physical Education and Recreation.
- Barrow, H.M.: Man and Movement: Principles of Physical Education, Philadelphia Lea and Fabiger, 1977.
- Joseph, P.M.: Organisation of Physical Education, Kandivila, : Old students Association, T.I.P.E.
- Kamlesh, M.L. and Sangral, M.S. : History and Principles of Physical Education, Prakash Brothers, 1983.
- Wuest and Bucher: Foundations of Physical Education and Sports, B.I. Publications Pvt. Ltd., New Delhi.
- William, H.F.: Physical Education and Sports in Changing Society, Surjeet Publication, Delhi.

Physiological Aspects of Ageing

Unit-I

Growth and Biological Maturation: Relevance to Athletic Performance; Muscle Development during Childhood and Adolescence, Relevance to Understanding Effects of Growth on Performance.

Unit-II

Theory of Ageing, Age related changes in different body systems, Cardiovascular Concerns in the Young Athlete, Trainability During Childhood, Ageing and muscular strength, ageing and joint flexibility

Unit-III

Exercise guidelines for geriatric populations. Introduction to Masters Sports, Ageing and performance, Role of continued involvement, Psychosocial issues in Masters Sport, Model of lifespan physical activity, health and performance.

Recommended Books:

- Helge Hebestreit and Oded Bar-Or (2008) The Young Athlete. Blackwell Publishing Ltd.
- Joseph Baker, Sean Horton and Patricia Weir (2000) The Masters Athlete: Understanding the role of exercise in optimizing aging. Routledge.
- Fitness and Wellness: Warner W. K Hoeger and Sharvon A. Hoeger.
- Fitness & Wellness Concepts: Charles B. Corbina & Ruth Lindsey.
- Lifetime Fitness & Wellness- A personal choice, Melvin H. Williams.

MSSP 107

Laboratory I

Credits-3

- Introduction to laboratory techniques- pipetting, calculations, introduction to equipments, sterile techniques and lab safety.
- How to Use microscopes.
- To study Counting Chambers.
- To determine the total Red Blood Corpuscles count.
- To determine the total Leucocyte Count in blood.
- To measure the Haemoglobin concentration of blood.
- To measure Blood Pressure of a subject in different positions.
- Calculation of Energy expenditure
- Measurement of blood glucose Cholesterol/HDL, Glycerol, Lactate, Triglycerides
- Biochemical Assessment of Metabolites.
- Biochemical Assessment of Enzymes.
- Biochemical Assessment of Hormones.
- Estimation of sugars, iron, phosphate, Vitamin C and organic acids.
- Estimation of protein concentration.

MSSP 108

Laboratory II

Credits-3

- To analyse various planes and axes of the body.
- To demonstrate the surface anatomy and muscle attachments of following bones: Clavicle, Scapula, Humerus, Radius, Ulna, Meta Carpals, Phalanges, Femur, Tibia, Fibula, Patella, Tarsals and metatarsals
- To demonstrate the following joints including corresponding muscles and movements of Upper Extremity: Acromioclavicular joint, Sternoclavicular joint, Shoulder joint, Elbow joint, Proximal Radioulnar joint, Distal Radioulnar joint, Wrist joint, Thumb joint

- To demonstrate the following joints including corresponding muscles and movements of Lower Extremity: Hip Joint, Knee Complex, Ankle joint.
- Demonstration and Estimation of Centre of Gravity of Human Body.
- Determination of Human Gait pattern.

SEMESTER-II

MSSP 201

Principles and Methods of Sports Training

Credit 3

Unit-I

Scientific basis of Sports Training, Importance, Aims and Objectives of Sports Training; Characteristics of Sports Training; Biological Process in Training; Components of Physical Fitness (motor abilities) – Endurance, Strength, Speed, Flexibility, Co-ordination; Agility.

Unit-II

Principles of Sports Training - Overload, Specificity, Progression and Reversibility; Meaning and concept of Training load; Adaptation and Recovery, Super Compensation, Training Structure - Volume, Intensity, Frequency, Peaking, Errors in Training, Adaptations to Resistance Training, Adaptations to Aerobic and Anaerobic Training.

Unit-III

Training plan; Need and importance in planning; Types of training plans - short term and long term plans; Training and Competition Cycles (training conception, macro, micro, meso); Periodization – Need, Types; Aims of various phases of Periodization (Preparatory, competition and transition); Competition -Types of Competition, Preparation for competition; the number and frequency of competition. Training athletes with disability, Adapted games for Disabled; Special Olympics and Paralympics.

Recommended Books:

- Physiology of Sport and Exercise 6th Edition with Web Study Guide-Loose-Leaf Edition by W. Larry Kenney, Jack Wilmore, David Costill.
- Periodization-6th Edition Theory and Methodology of Training by Tudor Bompa, Carlo Buzzichelli.
- Physiological Aspects of Sport Training and Performance, 2nd Edition, Human Kinetics by Jay Hoffman.
- Recovery for Performance in Sport by Institut National du Sport de l'Expertise et de la Performance INSEP, Human Kinetics, Christophe Hausswirth, A. Mujika.
- Essentials of Sports Training and Conditioning by JB Learning, NASM.
- Singh, H: Science of Sports training, DVS Publication, New Delhi, 1991.
- Matweyev, L.P.: Fundamentals of Sports training, publication Moscow, 1984.
- Harre, D: Principles of sports training, Sportverlag, Berlin, 1988.
- Singh, H: Science of Sports training: General theory and methods, NIS, Patiala, 1984.
- Scholisch, M: Circuit training, Sportverlag, Berlin.
- Willmore, J.H.: Athletic training and physical fitness, Antro and Becon Inc, Sydney.

MSSP 202

Performance Evaluation and Testing

Credit 3

Unit-I

Introduction to Test, Measurement, Evaluation and Research, Basic concepts in Tests: Evaluation, Validity, Reliability, Objectivity and Norms, Test construction and its Organisation and Administration; Pre-test considerations: Risks associated and Safety considerations, ACSM guidelines for when to stop a Test, Pre-exercise test evaluations: Calculation of HR MAX and 85% HR max depending on protocol, Population considerations: Children, Elderly and Apparently healthy.

Unit-II

Test Order: Equations used to estimate aerobic power from TM protocols, Equations used to estimate aerobic power from Cycle ergometer protocols (arm and leg), Calculations used to estimate aerobic power from other variables, Test protocols used for measuring the health and skill-related components of fitness, CV endurance field tests, VO₂max testing, Norm tables, Maximal versus submaximal tests.

Unit-III

Modes of testing, Muscular strength, endurance and flexibility, Body composition and Anthropometry, Balance, Agility, Coordination, Reaction time and Anaerobic power, Physical Fitness Batteries, Specific Sports Skill Tests (Soccer, Basketball, Volleyball, Hockey, Badminton, Tennis and other sports)

Recommended Books:

- Advanced Fitness Assessment and Exercise Prescription 8th Edition with Online Video, Human Kinetics by Ann Gibson, Dale Wagner, Vivian Heyward, 2018.

- Laboratory Manual for Exercise Physiology 2nd Edition. With Web Study Guide, Human Kinetics by G. Gregory Haff, Charles Dumke, 2018.
- Measurement and Evaluation in Human Performance 5th Edition, Human Kinetics by James Morrow Jr., Dale Mood, James Disch, Minsoo Kang, 2016.
- Physiological Tests for Elite Athletes 2nd Edition by Australian Institute of Sport Rebecca Tanner, Christopher Gore, 2012.
- ACSM's Guidelines for Exercise Testing and Prescription, 10th Edition by American College of Sports Medicine. Wolters Kluwer, 2017.
- Text book of Applied Measurement Evaluation & Sports Selection second edition: Dewinder K Kansal Sports & Spiritual Science Publications.
- Heyward, Vivian. Advanced Fitness Assessment and Exercise Prescription, 5th ed., Human Kinetics, 2006.
- ACSM's Guidelines for Exercise Testing and Prescription, 8th ed., Lippincott Williams and Wilkins, 2009.
- ACSM's Health-Related Physical Fitness Assessment Manual, 3rd ed., 2009.
- Ed. Durstine and Moore. ACSM's Exercise Management for Persons with Chronic Diseases and Disabilities, 2nd ed. Human Kinetics, 2003.

MSSP 203

Fatigue, Injuries and Rehabilitation

Credit 3

Unit-I

Concept of Overloading, Overtraining, Fatigue and Staleness, Symptoms and Causes of Fatigue, Types of Fatigue, Theories associated with Fatigue, Definition, Types, Symptoms, Findings, Underlying Mechanisms and Frequency of Overtraining and Overtraining Syndrome, Oxygen Debt Theory, Recovery Oxygen Uptake or Excess Post-exercise Oxygen Consumption (EPOC), Implications of EPOC for Exercise and Recovery, Optimal Recovery From Steady-Rate Exercise and Non-Steady-Rate Exercise, Intermittent Exercise and Recovery

Unit-II

Sports Injury- Meaning, Classification, Causes, Types, General guidelines for their Prevention, Recovery Time, Introduction and Management of common Sports Injuries (Fracture, Dislocation, Laceration, Abrasion, Sprain and Strain), How to avoid Sports Injuries, Role of Warm-up and Cool Down

Unit-III

Rehabilitation: Meaning, Concepts, Objective and scope of Rehabilitation, Principal of care and Rehabilitation
Therapeutic Modalities: Electrotherapeutic modalities (Shortwave Diathermy, Ultra Sound, T.E.N.S), Heat and Cold, Soft tissue Massage, Aquatic Rehabilitation Exercise, Therapeutic Exercise, Therapeutic Nutrition, Psychological Rehabilitation

Recommended Books:

- Shaun Phillips (2015) Fatigue in Sport and Exercise. Routledge, NY
- Therapeutic Modalities for Musculoskeletal Injuries 4th Edition, Human Kinetics by Craig Denegar, Ethan Saliba, Susan Saliba, 2016
- Essentials of Athletic injury management 10th edition by William E. Prentice, Human Kinetics.
- Clinical Sports Medicine Fifth Edition by Peter Brukner, Karim Khan, McGraw-Hill Education Australia, 2016
- Principles and Practice of Therapeutic Massage by Sinha, Jaypee Publishers
- Textbook of Electrotherapy by Singh Jagmohan, Jaypee Publishers
- Manfred Lehmann, Carl Foster, Uwe Gastmann, Hans Keizer and Jtirgen M. Steinacker(Eds) (1997) Overload, Performance Incompetence and Regeneration In sport. Kluwer Academic / Plenum Publishers, N.

MSSP 204

Food and Nutrition

Credit 3

Unit-I

Nutrients: Functions and Recommended Intakes, Healthy Eating and Balanced Diet, Fuel Sources for Muscle and Exercise Metabolism, Energy: Food Energy and Expenditure, Gastric Emptying, Digestion, and Absorption.

Unit-II

Nutritional Role and Recommendations for following: Carbohydrate, Fat, Protein and Amino Acids, Water Requirements and Fluid Balance, Vitamins and Minerals, Nutrition Supplements.

Unit-III

Nutrition and Training Adaptations, Nutrition and Immune Function in Athletes, Body Composition and Weight Management, Eating Disorders in Athletes, Personalized Nutrition, Menu Planning (Meal Timing and Spacing)

Recommended Books:

- Sport Nutrition 3rd Edition by Asker Jeukendrup, Michael Gleeson, Human Kinetics, 2018.
- Nutrition for Sport, Exercise, and Health by Marie Spano, Laura Kruskall, D. Travis Thomas, Human Kinetics.

- Physiology of Sport and Exercise 6th Edition with Web Study Guide-Loose-Leaf Edition by W. Larry Kenney, Jack Wilmore, David Costill.
- Exercise Physiology: Nutrition, Energy and Human Performance 8th Edition by William D. McArdle, Frank I. Katch, Victor L. Katch
- Nancy Clark's Sports Nutrition Guidebook by Nancy Clark, Human Kinetics
- NSCA's Guide to Sport and Exercise Nutrition by National Strength Conditioning Association, Human Kinetics
- Fundamental of Foods, Nutrition & Diet Therapy 5th edition by S.R. Mudambi, M.V. Rajagopal, New Age International Limited, New Delhi.
- Applied Nutrition. By R. Rajlaxmi, IBH Publications, New Delhi.
- Nutritional Supplements in Sports, Exercise and Health: An A to Z Guide by Linda M. Castell, Smantha J. Stear, Louise M. Burke, Routledge.

MSSP 205

Statistics for Sports Science

Credit 3

Unit-I

Introduction to Biostatistics, Frequency Distribution, Variable and Attribute, Line-diagram, Bar-diagram, Pie chart, Histogram, Mean, Median and Mode.

Unit-II

Variance, Standard deviation; Standard error of mean, Null hypothesis, Level of significance and Probability; Regression and correlation.

Unit-III

Student's t-test, Fisher's t-test, Chi-square test, Analysis of Variance (ANOVA), ANCOVA.
Introduction and Application of Statistical Softwares

Recommended Books:

- A Text book of Biostatistics, by A.K.Sharma, Discovery publishing house
- Introduction to Biostatistics, By Dr. Pranab Kumar Banerjee, S. Chand Publishers
- Research Methodology: Methods and Techniques Book by C. R. Kothari
- Dutta N.K. Fundamentals of Bio-Statistics. 2002; Kanishka Publishers, New Delhi.
- Gupta S.P. Statistical Methods. 2004; S. Chand & Sons, New Delhi
- Ruud H. Koning and James H. Albert (2008) Statistical thinking in sports. Chapman & Hall/CRC

MSSP 206

Elective II

Credit 3

Kinanthropometry in Sports

Unit-I

Introduction, scope and general consideration, i.e. Application of anthropometric data in sports, Body proportions and indices, Sports specific body proportions and indices, Body mass index and its importance in sports'

Unit-II

Anthropometric Measurements and Procedures, Equipment for anthropometric measurements, Gross Body Measurements and procedures, Length of Body Parts, Measurements and procedures, Diameters of Body Parts, Measurements and procedures, Circumferences of Body Parts, Measurements and procedures, Skinfold Thickness, Measurements and procedures.

Unit-III

Physiological Maturation: Decimal Age and concept of Physiological maturity in sports. Assessment of skeletal maturity of athletes, Body Composition: Anthropometric determination, Importance in sports and various methods to estimate body composition, Somatotyping: Introduction, Definition of Somatotyping and Classification

Recommended Books:

- Sports Anthropometry by H.S. Sodhi, ANOVA Publication.
- Physique and Selection of Sportsmen by H.S. Sodhi and L.S. Sidhu.
- Kinanthropometry by S.P. Singh and P. Malhotra, Luna Publication, Patiala.
- Kinanthropometry by Roger Eston and Thomas Reilly, E & F.N. SPON, London.
- Skeletal Maturity by S.P. Singh, L.S. Sidhu, and J. Singh, Human Biology Publication Society, Punjabi University, Patiala.
- Genetic and Anthropological Studies of Olympic Athletes by De Garray, Louis Levine & Cater, Academic Press, London.

Health Fitness and Wellness

Unit-I

Introduction to Health: Concept of health, Lifestyle and Disease, Ageing

Unit-II

Physical Activities & Fitness: Concept to Fitness, Exercise and its Principles, Health Education Recreation & Dance

Unit-III

Healthy Life Style Approach: Concept of Wellness, Wellbeing, Stress Management

Recommended Books:

- Fitness and Wellness: Warner W. K Hoeger and Sharvon A. Hoeger
- Fitness & Wellness Concepts": Charles B. Corbina & Ruth Lindsey
- Lifetime Fitness & Wellness - A personal choice": Melvin H. Williams
- Oxford Textbook of Public Health, Helen Liepman.
- Sunderlal, Aadarsh, Pankaj, 2007, Textbook of Community Medicine, CBS Publishers & Distributors.
- Kirch, Wilhelm, 2008, Encyclopedia of Public Health, Volume 1 & 2, Kluwer Academic Publishers.
- Mary -Jane Schneider and Henrey Schneider, 2006 (2nd edition), Introduction to Public Health, Jones and Bartlett Publishers.

Adaptations to Exercise and Training

Unit-I

Cardiovascular Adaptations to Endurance and Strength Training, Hypertrophy and Cardiomyopathy in Young and Older Athletes, Heart rate training zone, Effects Of High Altitude, Sudden Cardiac Death and Exercise in Healthy Adults

Unit-II

Respiratory System Adaptations to Endurance and Strength Training, Ventilatory response to exercise and its use in sports, Ventilatory threshold, Effects Of Exercise, response to steady- state exercise, Exercise-Induced Bronchoconstriction, Control of Breathing during exercise; The Respiratory System under Stress, respiratory systems adaptation to long-term exercise, Adaptations to systematic Training, Effects Of High Altitude

Unit-III

Muscular Mechanisms in Aerobic Endurance Training; Neural Mechanisms in Aerobic Endurance Training, Muscle Molecular Mechanisms in Strength Training, Muscle Property Changes in Strength Training, Neural Mechanisms in Strength Training. Initial responses of the neuromuscular systems to exercise; Training Adaptation of the Neuromuscular System

Recommended Books:

- Roy J. Shephard and Henry S. Miller, Jr. (1999) Exercise and the Heart in Health and Disease. Marcel Dekker
- Shephard, R.J. and Astrand, P.-O. (1992) Endurance in sport. Blackwell Science Ltd, USA
- McArdle, W.D., Katch, F.I., Katch, V.L. (2006) Essentials of Exercise Physiology. Lippincott Williams and Wilkins, USA.
- Victor F. Froelicher, Jonathan Myers (2006) Exercise and the heart. Elsevier Inc.
- Christopher B. Cooper and Thomas W. Storer (2004) Exercise testing and interpretation- A practical approach. Cambridge University Press.
- K. Wasserman, J Hansen, D Sue, W Stringer, B Whipp, eds (2004) Principles of Exercise Testing and Interpretation, 4th edn.. Lippincott Williams & Wilkins, Philadelphia, USA.
- Christopher Bell. Cardiovascular Physiology in Exercise and Sport . 1st Edition. 2008; Churchill Livingstone
- Michael G. Levitzky. Pulmonary Physiology, 8e. 2013; Lange. The McGraw-Hill Companies.
- Denise L. Smith and Bo Fernhall (2011) Advanced cardiovascular exercise physiology. Human Kinetics

MSSP 207

Laboratory III

Credit 3

- Techniques of taking various anthropometric measurements
- To define and illustrate various body landmarks
- Gross body measurements: Body weight (Kg), Stature, sitting height, Height of anterior superior Iliac spine, Subischial length.
- Diameters or Breadths (cms): Bicristal diameter (Shoulder Breadth), Transverse chest diameter, Anteroposterior chest diameter, Femur bicondylar diameter (knee breadth), Humerus Bicondylar diameter (elbow Breadth)
- BMI Estimation with and without software
- Assess Energy and Nutrient intake from Diet using suitable Software
- Circumferences or Girths of body parts, Calf circumference, Thigh circumference, Waist circumference, Chest circumference
- Skinfold measurement and Body Fat Percentage calculations
- Training Program: Circuit Training Program, Interval Training Program, Ballistic Training Program, Fertlek Training Program

MSSP 208

Laboratory IV

Credit 3

- Aerobic Power Field Assessments: Cooper 1.5-Mile Run/Walk Test and 12-Minute Run/Walk Test, Rockport Fitness Walking Test

- High-Intensity Fitness Testing: Léger 20 m Shuttle Run Test, Yo-Yo Intermittent Recovery Test, 30-15 Intermittent Fitness Test, Sprinting Performance, Jumping Performance, Power Endurance, Anaerobic Cycling Power, Margaria-Kalamen Stair-Climb Test, BROCKPORT test system, AAHPER health related physical fitness test, Philips JCR test for General motor ability testing
- Tests for: Speed, Agility, Balance, Coordination, Reaction time, Flexibility
- Sports Skill Tests for: Soccer, Basketball, Hockey, Tennis

SEMESTER-III

MSSP 301

Physiology of Sports and Exercise

Credit 3

Unit I

Introduction to Exercise and Sport Physiology, Structure and Function of Exercising Muscle, Fuel for Exercise: Bioenergetics and Muscle Metabolism

Unit II

The Cardiovascular System and Its Control, Electrophysiology of Heart, Introduction and interpretation of EKG/ECG, Pacemakers and its Rhythms

Unit III

The Respiratory System and Its Regulation, Cardiorespiratory Responses to Acute Exercise, Energy Expenditure and Fatigue

Recommended Books:

- Physiology of Sport and Exercise 6th Edition with Web Study Guide-Loose-Leaf Edition by W. Larry Kenney, Jack Wilmore, David Costill.
- Physiological Aspects of Sport Training and Performance With Web Resource- 2nd Edition, Human Kinetics By Jay Hoffman
- Exercise Physiology: Theory and Application to Fitness and Performance 10th Edition By Scott Powers and Edward Howley 2018.
- Exercise Physiology: Nutrition, Energy, and Human Performance 8th Edition by William D. McArdle, Frank I. Katch, Victor L. Katch
- Laboratory Manual for Exercise Physiology 2nd Edition. With Web Study Guide, Human Kinetics by G. Gregory Haff, Charles Dumke, 2018.
- A Textbook of Sports & Exercise Physiology by Dey Swapan Kumar, Jaypee Publishers
- Practical ECG for Exercise Science and Sports Medicine by Greg Whyte, Sanjay Sharma, Human Kinetics, 2010
- Physiological Tests for Elite Athletes 2nd Edition by Australian Institute of Sport Rebecca Tanner, Christopher Gore, 2012.
- ACSM's Guidelines for Exercise Testing and Prescription, 10th Edition by American College of Sports Medicine. Wolters Kluwer, 2017
- Recovery for Performance in Sport by Institut National du Sport de l'Expertise et de la Performance INSEP, Human Kinetics, Christophe Hausswirth, A. Mujika
- A Textbook of Sports & Exercise Physiology by Swapan kumar Dey, Jaypee brother, 2012.

MSSP 302

Sports Ergonomics and Ergogenic Aids

Credit 3

Unit-I

Introduction to Ergonomics; Ergonomical Risk Factors in Sports: Physical Properties of Human Structures, Health and Safety, Environmental Stress, Circadian Rhythms and Sports training; Ergonomics Models and Training Modes in Sport and Leisure, Competitive and Training Stress in Sport

Unit-II

Influence of Sports Equipment and Playing Surfaces, Ergonomics in Physical Activities, Clinical Aspects in Sports Ergonomics, Holistic and Nutritional Ergonomics Perspective

Unit-III

Ergogenic Aids in Sport, Researching Ergogenic Aids, Nutritional Ergogenic Aids, Anti-Doping Codes and Drug Testing, WADA and NADA, Prohibited Substances and Techniques

Recommended Books:

- Handbook of Ergonomics in Sport and Exercise Edited by Youlian Hong, Routledge 2013
- Ergonomics in Sport and Physical Activity Enhancing Performance and Improving Safety by Thomas Reilly, Human Kinetics, 2010.
- Physiology of Sport and Exercise 6th Edition with Web Study Guide-Loose-Leaf Edition by W. Larry Kenney, Jack Wilmore, David Costill
- A Textbook of Sports & Exercise Physiology by Dey Swapan Kumar, Jaypee Publishers

- IOC Manual of Sports Injuries: An Illustrated Guide to the Management of Injuries in Physical Activity by Roald Bahr, John Wiley & Sons, 2012
- Principles of Manual Therapy (A Manual Therapy Approach to Musculoskeletal Dysfunction) by Sebastian Deepak, Jaypee Publishers

MSSP 303

Fitness Assessments and Exercise Prescription

Credit 3

Unit-I

Physical Activity and Physiological Benefits, Health and Chronic Disease, Preliminary Health Screening and Risk Classification, Health-Related Physical Fitness, Testing and Interpretation, Interpretation of Clinical Exercise Test Results

Unit-II

Principles of Assessment, Prescription, and Exercise Program Adherence, Designing Resistance Training Programs, Exercise Prescription for Healthy Populations with Special Considerations and Environmental Considerations, Exercise Prescription for Patients with Cardiovascular and Cerebrovascular Disease

Unit-III

Exercise Prescription for Pulmonary Diseases, Neuromuscular Diseases, Diabetic Patients and Cancer Patients. Exercise Prescription for Pregnancy, Designing Weight Management and Body Composition Programs, Behavioral Theories and Strategies for Promoting Exercise

Recommended Books:

- ACSM's Guidelines for Exercise Testing and Prescription, Edition 10 by American College of Sports Medicine
- Advanced Fitness Assessment and Exercise Prescription 8th Edition by Ann Gibson, Dale Wagner, Vivian Heyward, Human Kinetics, 2018
- Principles of Exercise Prescription by V Bhutkar Milind, Jaypee Publishers
- Physiology of Sport and Exercise 6th Edition with Web Study Guide-Loose-Leaf Edition by W. Larry Kenney, Jack Wilmore, David Costill.
- Principles of Manual Therapy (A Manual Therapy Approach to Musculoskeletal Dysfunction) by Sebastian Deepak, Jaypee Publishers
- Physiological Tests for Elite Athletes 2nd Edition by Australian Institute of Sport Rebecca Tanner, Christopher Gore, 2012
- Measurement and Evaluation in Human Performance 5th Edition, Human Kinetics by James Morrow Jr., Dale Mood, James Disch, Minsoo Kang, 2016
- Laboratory Manual for Exercise Physiology 2nd Edition. With Web Study Guide, Human Kinetics by G. Gregory Haff, Charles Dumke, 2018.
- Therapeutic Exercise- Foundations & Techniques by Carolyn Kisner & Lynn Allen Colby, Jay Pee Brothers, New Delhi.
- Pollock's Textbook of Cardiovascular Disease and Rehabilitation by JL Durstine, HK

MSSP 304

Neuroscience and Endocrinology in Sports

Credit 3

Unit-I

Neural Control of Exercising Muscle, Hormonal Control during Exercise, Body Composition and Nutrition for Sport

Unit-II

Metabolic Effects of Exercise, Aging in Sport and Exercise, Sex Differences in Sport and Exercise

Unit-III

Obesity, Diabetes, and Physical Activity, Energy Balance and Weight Control, Exercise Training in the Normal Female: Effects of Low Energy Availability on Reproductive Functions, Cardiovascular Disease and Physical Activity

Recommended Books:

- Physiology of Sport and Exercise 6th Edition with Web Study Guide-Loose-Leaf Edition by W. Larry Kenney, Jack Wilmore, David Costill.
- Physiological Aspects of Sport Training and Performance With Web Resource- 2nd Edition, Human Kinetics By Jay Hoffman
- Exercise Physiology: Theory and Application to Fitness and Performance 10th Edition by Scott Powers and Edward Howley 2018.
- Exercise Physiology: Nutrition, Energy, and Human Performance 8th Edition by William D. McArdle, Frank I. Katch, Victor L. Katch
- Laboratory Manual for Exercise Physiology 2nd Edition. With Web Study Guide, Human Kinetics by G. Gregory Haff, Charles Dumke, 2018.

- Measurement and Evaluation in Human Performance 5th Edition, Human Kinetics by James Morrow Jr., Dale Mood, James Disch, Minsoo Kang, 2016.
- Physiological Tests for Elite Athletes 2nd Edition by Australian Institute of Sport Rebecca Tanner, Christopher Gore, 2012.
- ACSM's Guidelines for Exercise Testing and Prescription, 10th Edition by American College of Sports Medicine. Wolters Kluwer, 2017
- Endocrinology of Physical Activity and Sport, Second Edition Constantini, Naama, Hackney, Anthony C, 2013.
- Advanced Exercise Endocrinology, Human Kinetics by Katarina Borer, 2013.
- Handbook of Neuroscience and Psychophysiology by Roland Carlstedt.

MSSP 305

Physiological Support for Athletes

Credit 3

Unit-I

Physiology of the Performance, Environmental Influences on Performance, Physical Activity for Health and Fitness, Prescription of Exercise for Health and Fitness

Unit-II

Concept of Athlete Support, Athlete Development stages- Child, Pre-adolescent, Adolescent and Adult, Talent Identification, Steps of Sports talent Selection and counselling, Factors affecting Physical Growth and Development, Talent Development and Promotion

Unit-III

Athlete Monitoring and Analysis, Time-motion analysis in Sport; Analysis of Athlete Tracking Systems; GPS and accelerometer analysis of training and competition; monitoring and analysis of sport-specific physical and psychological variables; physiological monitoring; external sources of data relating to sports performance; reliability of data and sources. The use of performance indicators in performance analysis, Feedback based analysis of performance, Sport-specific notational systems; computerized notational analysis; notation in individual sports; notation in team sports; augmented feedback through video-based technologies

Recommended Books:

- Physiology of Sport and Exercise 6th Edition with Web Study Guide-Loose-Leaf Edition by W. Larry Kenney, Jack Wilmore, David Costill.
- Physiological Aspects of Sport Training and Performance With Web Resource- 2nd Edition, Human Kinetics By Jay Hoffman
- Exercise Physiology: Theory and Application to Fitness and Performance 10th Edition By Scott Powers and Edward Howley 2018.
- Talent Identification and Development in Sport International Perspectives Edited by Joseph Baker, Steve Copley, Jörg Schorer © 2012 – Routledge
- IOC Manual of Sports Injuries: An Illustrated Guide to the Management of Injuries in Physical Activity by Roald Bahr, John Wiley & Sons, 2012
- Peter O'Donoghue.(2015) An introduction to performance analysis of sport.
- Carol-Lynne and Moore, Kaoru Yamamoto (2012) Beyond words movement observation and analysis. Routledge, NY.
- Routledge, NY Mike Hughes and Ian M. Franks.(2015) Essentials of performance analysis in sport. Routledge, NY

MSSP 306

Elective III

Credit 3

Drugs and Doping in Sports

Unit I

The Evolution of Doping and Anti-doping in Sports, Prevalence of Doping in Sports, Doping Control in Sports, Inadvertent Use of Prohibited Substances in Sports, Role of Athlete Support Personnel in Preventing Deliberate and Inadvertent Use of Prohibited Substances, WADA Rules and Regulations Regarding Inadvertent Use of Prohibited Substances.

Unit II

Different Methods and Chemicals of Doping and Masking, Anabolic Androgenic Steroids, Stimulants, Glucocorticoids, Peptide-Protein Hormone, Beta-2 Agonists, Hormone and Metabolic Modulators, Narcotics, Beta Blockers, Manipulation of Blood and Blood Components, Chemical and Physical Manipulations, Gene Doping, Diuretics and Masking

Unit III

Substances and Methods Permitted in Sports, Sport Supplements and Herbal Preparations, Evolving Issues Concerning Drug Use in Sports, Athletic Testing, Analytical Procedures and Adverse Analytical Findings, The Future of Performance Enhancing Substances in Sports, Anti-doping Movement

Recommended Books:

- Anthony C Hackey (2017) Doping, Performance-Enhancing Drugs, and Hormones in Sports ISBN:978-0-12-813442-9
- David R. Mottram, Neil Chester (2018) Drugs in Sports, Routledge, ISBN:1351838989
- Portefield, Jason (2008) Doping: athletes and drugs, Rosenn Publishing, New York, ISBN:1-4042-1917-5

Sports Genetics and Performance

Unit I

Basic Genetic Concepts, Mendelian inheritance, population genetics, Human chromosome Karyotype, Chromosome Disorders, Genome Structure and Genetic Mapping, Mitochondrial Inheritance, The Genetic Code and Genetic Alterations, DNA Injuries and Repair, Monogenic and Polygenetic Diseases, Molecular Diagnostics

Unit II

Ethics of Genetic Testing and Research in Sport, Current Challenges and Directions to the Future, Genetic Modifications in Sports, Ethical Considerations of Genetic Manipulation in Sport, Gene Therapy and Gene Doping

Unit III

Connecting Sports and Genetics, The Genetics of Sports Injuries and Athletic Performance, Genetic Contributors To Hypertrophic Cardiomyopathy, Chronic Traumatic Encephalopathy, Different Classes of Performance Enhancing Genetic Variants

Recommended Books:

- Bruce R. Korf and Mira B Irons (2012) Human Genetics and Genomics, WILEY-BLACKWELL
- Manu L Kothari, Lopa A Mehta, Sadhana S roychoudhury, (2009) Principles of Genetics, Universities Press
- Ricki Lewis (2017) Human Genetics the basics, Routledge, ISBN 978-1-138-66801-0
- Michael Posthum and Malcolm Collins (2016) Genetics and Sports, Karger Publisher
- Elaine A. Ostrander, Heather J. Huson, and Gary K. Ostrander Genetics of Athletic Performance (2009) Annu. Rev. Genomics Hum. Genet. 2009.10:407–29
- Lisa M. Guth and Stephen M. Roth (2013) Genetic influence on athletic performance, Curr Opin Pediatr. 2013 December; 25(6): 653–658.
- Nicola Mafulli et al (2013) the genetics of sports injuries and athletic performance. Muscles, Ligaments and Tendons Journal, 3 (3): 173-189

Exercise Immunology

Unit I

Immunological system and exercise: Exercise and innate and humoral immunity, Exercise induced change in Ig and antibody, exercise and cytokines.

Unit II

Sex Differences in Immune Function after Aerobic Exercise, Sex differences in immune variables and respiratory infection, Killer cell immunoglobulin-like receptors and exercise, Anti-inflammatory influence of exercise training- Physical activity, fitness, and chronic inflammation, C-Reactive Protein (CRP)

Unit III

Cytokines, Free radicals, Antioxidants, Effect of exercise on immunity, Physical activity – A stimulator and an inhibitor to the immune system, Exercise and upper respiratory tract infection, Infection and exercise performance, Exercise and HIV infection, Exercise and Cancer, Exercise aging and immunity, Maintaining immune health, Importance of exercise immunology in health promotion.

Recommended Books:

- Michael Gleeson, Nicolette Bishop, and Neil Walsh.(Eds) (2013) Exercise immunology. Routledge
- Warren Levinson (2016) Review of Medical Microbiology and Immunology. LANGE, Mc Graw Hill

MSSP 307

Laboratory V

Credit 2

- Blood Pressure Measurements: Effects of Body Position, Dynamic Exercise and Isometric Contractions on BP
- Resting Metabolic Rate Determinations: Predicting and Measuring RMR
- Determination of VO₂max by direct and indirect method.
- Assessment of Peak lactate, lactate tolerance, lactate clearance.
- Determination of anaerobic threshold.

- Assessment of EMG and ECG.
- Oxygen Deficit and EPOC Evaluations
- Submaximal Exercise Testing: Submaximal Bench Step Test, Submaximal Treadmill Test, Submaximal Cycle Ergometer Test
- Pulmonary Function Testing: Lung Volumes and Capacities, Pulmonary Function

MSSP 308

Laboratory VI

Credit 2

- MMT for Major Muscle Groups of the body
- Use of Body Composition Software
- Use of Fitness Related Software
- Exercise Prescription and Counselling for Weight Management
- Demonstration of ROM Exercises and Prescription
- Measurement of heart rate and blood pressure during and after exercise. (each student is expected to practice measurement on 50 volunteers and determine intra experimenter and inter-experimenter variation)
- Cardio-pulmonary resuscitation practice on Human Mannequin
- Aerobic power measurement using Queens' college test, Astrand-Rhyming test.
- Tests for anaerobic power (Wingate Test)

SEMESTER-IV

MSSP 401

Research Methodology

Credit 3

Unit-I

Introduction to Research in Physical Activity, Developing the Problem and Using the Literature, Presenting the Problem, Formulating the Method, Ethical Issues in Research and Scholarship

Unit-II

Types of Research: Socio Historical Process in Sport Studies, Philosophical Research in Physical Activity, Research Synthesis (Meta-Analysis), Surveys, Other Descriptive Research Methods, Physical Activity Epidemiology Research, Experimental and Quasi-Experimental Research, Qualitative Research, Mixed-Methods Research

Unit-III

Writing the Research Report: Completing the Research Process, Ways of Reporting Research

Introduction to review of literature, Evaluation of scientific literature; organizing literature – strategies, use of software; Meta-analysis, Writing review – structuring the review, quoting/paraphrasing, the citation referencing system

Recommended Books:

- Research Methodology: Methods and Techniques by C. R. Kothari
- ICMR. Ethical Guidelines for Biomedical Research on Human Subjects. 2006; ICMR, New Delhi.
- Research Methods in Physical Activity- 7th Edition By Jerry Thomas, Jack Nelson, Stephen Silverman, Human Kinetics
- Research Methods in Sport by Mark F Smith
- Research Methods for Sports Performance Analysis By Peter O' Donoghue
- Research Methods in Physical Education and Youth Sport 1st Edition by Kathleen Armour and Doune Macdonald
- Ridley, D. The Literature Review a step-by-step guide for students. 2012; Sage Publications Limited, New Delhi.