School of Sports Sciences Department of Sports Bio-Sciences



Proposed Course Structure and Course Details M.Sc. Sports Nutrition

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

M.Sc. Sports Nutrition

SEMESTER I (Total credits: 24)

Code	Title of Course	Type of Course	Credits
MSSN 101	Human Anatomy and Physiology	Core 1	4
MSSN 102	Biomolecules and Metabolism	Core 2	4
MSSN 103	Food and Nutrition	Core 3	4
MSSN 104	Introduction to biomechanics	Core 4	4
MSSN 105	Discipline Elective I	DE 1	4
MSSN 106	Practicum I	P 1	2
MSSN 107	Practicum II	P 2	2
MSSN 108	Fitness		1
MSSN 109	Societal		1

SEMESTER II (Total credits: 24)

Code	Title of Course	Type of Course	Credits
MSSN 201	Kinesiology	Core 5	4
MSSN 202	Psychological and Social Aspects of Sports	Core 6	4
MSSN 203	Principles and methods of Sports Training	Core 7	4
MSSN 204	Discipline Elective II	DE 2	4
MSSN 205	Discipline Elective III	DE 3	4
MSSN 206	Practicum III	P 3	2
MSSN 207	Practicum IV	P 4	2
MSSN 208	Fitness		1
MSSN 209	Societal		1

SEMESTER III (Total credits: 24)

Code	Title of Course	Type of Course	Credits
MSSN 301	Dietary Supplements and Ergogenic Aids	Core 8	4
MSSN 302	Sports Specific Nutrition	Core 9	4
MSSN 303	Discipline Elective IV	DE 4	4
MSSN 304	Discipline Elective V	DE 5	4
MSSN 305	Elective I	E 1	4
MSSN 306	Practicum V	P 5	2
MSSN 307	Practicum VI	P 6	2
MSSN 308	Fitness		1
MSSN 309	Societal		1

SEMESTER IV (Total credits: 24)

Code	Title of Course	Type of Course	Credits
MSSN 401	Discipline Elective VI	DE 6	4
MSSN 402	Elective II	E 2	4
MSSN 403	Dissertation		16
MSSN 404	Fitness		1
MSSN 405	Societal		1

Any other Elective Courses introduced from time to time will be included in the Discipline Elective (DE) of the M.Sc. Programme.

	List of Elective	papers offered	by the De	partment
--	------------------	----------------	-----------	----------

List of Elective papers offered by the Department				
Code	Title of Course	Type of Course	Credits	
MSSN 105/204/205/303/304/305	Fatigue, Injuries and Rehabilitation	Elective	4	
MSSN 105/204/205/303/304/305	Essentials of Sports	Elective	4	
MSSN 105/204/205/303/304/305	Kinanthropometry	Elective	4	
MSSN 105/204/205/303/304/305	Health Fitness and Wellness	Elective	4	
MSSN 105/204/205/303/304/305	Research Methodology	Elective	4	
MSSN 105/204/205/303/304/305	Assessment of Health and Fitness of Athlete	Elective	4	
MSSN 105/204/205/303/304/305	Nutrigenomics	Elective	4	
MSSN 105/204/205/303/304/305	Food safety and Standardization	Elective	4	
MSSN 105/204/205/303/304/305	Adaptations to Exercise and Training	Elective	4	
MSSN 105/204/205/303/304/305	Therapeutic Sports Nutrition	Elective	4	
MSSN 105/204/205/303/304/305	Food Psychology and counseling	Elective	4	
MSSN 105/204/205/303/304/305	Nutritional Biochemistry	Elective	4	
MSSN 105/204/205/303/304/305	Exercise Physiology	Elective	4	
MSSN 105/204/205/303/304/305	Statistics for Sports Science	Elective	4	

SEMESTER-I

MSSN 101

Human Anatomy and Physiology

Credit 4

Unit-I

Basis of cell biology; Anatomy and Physiology of Cardiovascular System Lymphatic System, Respiratory System and acute effects of exercise on cardiovascular, lymphatic and respiratory systems.

<u>Unit-II</u>

Anatomy and Physiology of: Nervous System, Special Senses, Endocrine System, Musculoskeletal system and acute effects of exercise on Nervous, Endocrine, and Musculoskeletal systems.

<u>Unit-III</u>

Anatomy and Physiology of: Digestive System, Immune System, Urinary System, Reproductive System, and Integumentary System and acute effects of exercise on Digestive, Immune and Urinary systems.

<u>Unit –IV</u>

Anatomy and Physiology of: Reproductive System, and Integumentary System and acute effects of exercise on Reproductive System, and Integumentary System

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

Biomolecules and Metabolism

<u>Unit I</u>

MSSN 102

Foundation of Biochemistry: Biomolecules- chemical composition and bonding - chemical reactivity - buffers - buffering in biological systems. Principles of bioenergetics- Laws of thermodynamics and their applications in biological system – entropy and enthalpy

<u>Unit II</u>

Carbohydrates-Monosaccharides- disaccharides- oligosaccharides- polysaccharides- structure and biological functions of homo- and heteropolysaccharides. Proteins-primary- secondary- tertiary and quaternary structure- Ramachandran plot;

Unit III

Nature of enzymes- classification and nomenclature of enzymes Lipids- Classification- structure and properties- phospholipidsglycoplipidssphingolipids- cholesterol. Fatty acids- saturated and unsaturated fatty acids;Nucleic acids- types and structural organization- triple helix of DNA

Unit IV

General introduction- Metabolism- Anabolism- Catabolism- Vitamins-Coenzymes.; Carbohydrates metabolism; Metabolism of Lipids; Metabolism of Proteins; Metabolism of Lactate, ; Major Metabolic Pathways in Human and its Relevance with Exercise: Citric Acid Cycle, Electron Transfer System in Mitochondria, Oxidative Phosphorylation

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
- BiochemistryJM 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.

MSSN 103

Food and Nutrition

Credit 4

Credit 4

Unit-I

Nutrients and nutritional Role of macro and micro nutrients: Water Requirements and Fluid Balance, Nutrition Supplements. Gastric Emptying, Digestion, and Absorption.

<u>Unit-II</u>

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

<u>Unit-III</u>

Nutrition and Immune Function in Athletes, Body Composition and Weight Management, Eating Disorders in Athletes,

<u>Unit-IV</u>

Personalized Nutrition, Menu Planning (Meal Timing and Spacing); Principles of diet planning, Food data table and Usage of software, validity and reliability of dietary assessment tools, translating the dietary intake into analysis and determining nutritional information.

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.

MSSN 104

Introduction to biomechanics

<u>Unit –I</u>

Exercise and sports biomechanics basic concepts of kinematics and kinetics – vectors, motion, degrees of freedom, force, moment of force, equilibrium. Biomechanical considerations in reducing sporting injury rates.

<u>Unit –II</u>

Posture static and dynamic posture, postural diversity within individuals, posture and its relationship to somatotype posture assessment, desirable postures for high level sport performance, modifying posture and technique to improve performance.

<u>Unit –III</u>

Movement patterns – the essence of sports biomechanics, Qualitative analysis of sports movements, More on movement patterns – the geometry of motion, Quantitative analysis of movement, Causes of movement – forces and torques.

Unit-IV

Image analysis in sports performance errors in motion analysis, planar Video analysis, 3d motion analysis, data filtering.

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.

MSSN 105	Discipline Elective I	Credit 4

MSSN 106

Practicum I

- Introduction to laboratory techniques and good laboratory practices.
- How to Use microscopes.
- To determine the total Red Blood Corpuscles count.
- To determine the total Leucocyte Count in blood.
- To measure Blood Pressure of a subject in different positions
- Assessment of Iron Status of athletes (Hb estimation, Hematocrit, Transferrin, Ferritin and TIBC)
- Calculation of Energy expenditure
- Measurement of blood glucose
- Measurement of blood Lipid Profile
- Biochemical Assessment of Metabolites (Lactate and Urea).
- Biochemical Assessment of Enzymes.
- Biochemical Assessment of Hormones.

MSSN 107

Practicum II

• BMI Estimation with and without software

- Assess Energy and Nutrient intake from Diet using suitable Software
- Estimation of sugars, iron, phosphate, vitamin C and organic acids in food.
- Estimation of protein concentration in food.
- 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, Radio carpal joint, Thumb joint
- To demonstrate the following joints including corresponding muscles and movements of Lower Extremity: Hip joint, Knee Complex and Ankle joint.
- Demonstration and Estimation of Centre of Gravity of Human Body.
- Determination of Human Gait pattern.

MSSN 108	Fitness	Credit 1

Credit 2

Credit 2

MSSN 109	Societal	Credit 1
WISSIN 109	Societai	Crean 1

SEMESTER-II

MSSN 201

Kinesiology

Credit 4

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

<u>Unit-II</u>

Bones: 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 and Lower Extremities;

<u>Unit III</u>

Joints: Meaning and types of joints, Joint flexibility, Technique to increase the flexibilities, Structure, function, fundamental movements around major joints

Unit-IV

Introduction to Muscular System: Muscles and Tendons, Classification of muscles, Structure of Skelton muscle, classification of muscles basis of the fibre arrangement, Physiology and types of muscle contraction, Origin, Insertion and action of major muscle groups of the Body.

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.

MSSN 202

Psychological and Social aspects of Sports

Credit 4

<u>Unit-I</u>

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 other related to Sports settings

<u>Unit-II</u>

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

<u>Unit-III</u>

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

Unit-IV

Concentration in sports, components, assessments, strategies of concentration. Knowledge of attentional control, Knowledge of attentional styles, mental preparation for sports performance, Commitment and confidence for sports performance.

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 Publisher Mehopolitan book co. Pvt. Ltd., Netaji Subash Marg, New Delhi 11002.
- Sanjeev. P. Sahni Psychology and its application in sports by, Publisher D.V.S. publications, 100, Giri Nagar Kalkaji, New Delhi-110019
- Agyajit Singh Psychology of coaching by, Friends Publications, # 101 Ansari Raod 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

Principles and methods of Sports Training

Credit 4

<u>Unit-I</u>

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

<u>Unit-II</u>

Methods of sports training: methods of development of various types of endurance, methods of development of various types of Strength, methods of development of various types of Speed.

Unit-III

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 Aerobic, Anaerobic and Resistance Training.

Unit-IV

Training plan; Need and importance in planning; Types of training plans - short term and long term plans; Training and Competition Cycles (micro, meso, and macro); Periodization – Need, Types and various phases of Periodization (Preparatory, competition and transition); Competition -Types 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 With Web Resource-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.

	MSSN 204	Discipline Elective II	Credit 4
--	----------	------------------------	----------

MSSN 206

Practicum III

- Techniques of taking various anthropometric measurements
- To define and illustrate various body landmarks
- Gross body measurements: Body weight (Kg), Stature, sitting height, Height of interior superior Iliac spine, Subischial length.
- Diameters or Breadths (cms): Bicristal diameter (Shoulder Breadth), Transverse chest diameter, Antero-posterior chest diameter, Femur bicondylar diameter (knee breadth), Humerus Bicondylar diameter (elbow Breadth)
- Circumferences or Girths of body parts, Calf circumference, Thigh circumference, Waist circumference, Chest circumference
- Skinfold measurement and Body Fat Percentage calculations

MSSN 207

Practicum IV

- BROCKPORT test system, AAHPER health related physical fitness test, Philips JCR test for General motor ability testing
- 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.
- Tests for Speed, Agility, Balance, Coordination, Reaction time, and Flexibility.
- Training Program: Circuit Training Program, Interval Training Program, Ballistic Training Program, Fertlek Training Program

MSSN 208	Fitness	Credit 1

MSSN 209 Societal	Credit 1
-------------------	----------

SEMESTER-III

MSSN 301

Dietary Supplements and Ergogenic Aids

Credit 4

<u>Unit I</u>

Nutritional supplements: Evolution into ergogenic aids and government regulations. Dietary supplement and Ergogenic Aids: Definition and classifications; DSHE Act of 1994 ; Government Protections from Dietary Supplement Hazards and Risks; New Dietary Ingredients; FDA Regulatory Action; Contaminated Supplements and Banned Ingredients; Anabolic Steroid Control Act; Adverse Event Regulation and Legislation; Contamination or Adulteration.

<u>Unit II</u>

Doping control and Supplement testing: World anti-doping agency (WADA) and National Anti-doping agency (NADA), Formation, History and Standards; List of prohibited substances and Drugs; Analytical procedures and testing of samples from athletes; Drug abuse and athletic performance; Regulations on Dietary supplements: FSSAI and NADA.The Role of Nutritional Supplements Complementing Nutrient-Dense Diets: General versus Sport/Exercise-Specific Dietary benefits, Use of Nutritional Supplements in Sport and Exercise; Consequences of mega dosage in sports performance

<u>Unit III</u>

Macronutrient and Micronutrient Supplements: Protein Supplements. CHO Supplements, Fat Supplements Vitamin Supplements Multi-Vitamin Supplements, Antioxidants Supplements.

Credit 4

Credit 2

Credit 2

<u>Unit IV</u>

Botanical Ergogenic Supplements, Metabolite Ergogenic Supplements, Use of Nutritional Supplements in Sport and Exercise: Usage, Dosage and safety. Behavioural Outcomes, Behavioral Effects of Selected Supplements Commonly Employed for Performance, Fitness, and Health.

Recommended Books:

- Antonio, J., & Stout, J. R. (2002). Supplements for endurance athletes. Human Kinetics.
- Greenwood, M., Cooke, M. B., Ziegenfuss, T., Kalman, D. S., & Antonio, J. (Eds.). (2015). Nutritional supplements in sports and exercise. Humana Press.
- Cooper, C. E. (2008). Drugs and ergogenic aids to improve sport performance. Essays in biochemistry, 44, 1-10.

MSSN 302

Sports Specific Nutrition

Credit 4

<u>Unit I</u>

Nutrition for team sports; Body composition; Game dynamics; Determining position wise fuel need; Quantity and timing of nutrient intake; Current research on position-specific nutrition needs and fuel utilisation; Current literature suggestions on food intake and recovery strategies; Supplement usage and Dietary periodisation among the athletes; Case studies on team sports. Dietary and Hydration Strategies; nutrient requirements

<u>Unit II</u>

Nutrition for individual sport; Body composition Game dynamics;; energy systems; Fuel utilisation; Duration and intensity of event; Dietary and Hydration Strategies; nutrient requirements; Distribution of macronutrients in the diet; Guidelines for fuel during different phases of training and competition; Nutrient timing; Travel nutrition; Use of Supplements; Case studies of athletes.

<u>Unit III</u>

Nutrition for Combative sports; Body composition Game dynamics;; energy systems; Fuel utilisation; Duration and intensity of event; Dietary and Hydration Strategies; nutrient requirements; Distribution of macronutrients in the diet; Guidelines for fuel during different phases of training and competition; Nutrient timing; Travel nutrition; Use of Supplements; Case studies of athletes.

<u>Unit IV</u>

Nutrition for Technical sports; Body composition Game dynamics;; energy systems; Fuel utilisation; Duration and intensity of event; Dietary and Hydration Strategies; nutrient requirements; Distribution of macronutrients in the diet; Guidelines for fuel during different phases of training and competition; Nutrient timing; Travel nutrition; Use of Supplements; Case studies of athletes.

Recommended Books:

- Maughan, R. J. (Ed.). (2008). Nutrition in sport (Vol. 7). John Wiley & Sons.
- Fink, H. H., & Mikesky, A. E. (2017). Practical applications in sports nutrition. Jones & Bartlett Learning.
- Eberle, S. G. (2013). Endurance Sports Nutrition, 3E. Human Kinetics.
- Ryan, M. (2012). Sports nutrition for endurance athletes. Velo Press.
- Campbell, B. (Ed.). (2013). Sports nutrition: enhancing athletic performance. CRC Press.
- Reaburn, P. R. (Ed.). (2014). Nutrition and Performance in Masters Athletes. CRCPress.
- Slater, G., & Phillips, S. M. (2011). Nutrition guidelines for strength sports: sprinting, weightlifting, throwing events, and bodybuilding. Journal of sports sciences, 29(sup1), S67-S77.
- Christoph Zinner and Billy Sperlich. (2016). Marathon Running: Physiology, Psychology, Nutrition and Training Aspects.

MSSN 303	Discipline Elective IV	Credit 4

MSSN 304	Discipline Elective V	Credit 4

MSSN 305	Elective I	Credit 4
MSSN 306	Practicum V	Credit 4

- Planning a year round diet for an athelete with different clinical conditions.
- Planning a year round diet for an athelete with Food-Related adverse reactions.
- Planning a diet for an athlete with sports-injury/Paralympic athlete.

- Planning a year round diet for vegetarian athletes.
- Nutrition strategies and menu planning for athletes in different altitude.
- Nutrition guidelines/suggestions for athletes while travelling and to overcome jet lag.
- Composition and brand names of supplements that improve Muscle mass commonly available in the market and role of nutrients listed in athletic performance.
- Composition and brand names of different supplements commonly available in the market.
- Providing diet for clinical conditions with supplement usage (Planning the type, quantity and timing of supplement intake.
- Methods of measuring dietary recalls: Food diary, Weighed food record, Recall.
- Procedure to collect and monitor activity record using Time Allocation Pattern and activity monitors.
- Energy balance: Calculation of total energy expenditure (TEE) and energy intake.
- Measuring body composition using various techniques: BOD POD, DEXA.

MSSN 307

Practicum VI

- Menu planning and fluid intake during training and competition including nutrient periodization for Cricket/football/Hockey players.
- Menu planning and fluid intake during training and competition including nutrient periodization for sprinters/Marathon Runners.
- Menu planning and fluid intake during training and competition including nutrient periodization for badminton.
- Menu planning and fluid intake during training and competition including nutrient periodization for rowing.
- Menu planning and fluid intake during training and competition including nutrient periodization and weight-management for power sports/gymnastics.
- Menu planning during training and competition including nutrient periodization for archery.

MSSN 308	Fitness	Credit 1

MSSN 309	Societal	Credit 1

SEMESTER-IV

MSSN 401	Discipline Elective VI	Credit 4

	MSSN 402	Elective II	Credit 4
--	----------	-------------	----------

MSSN 403	Dissertation	Credit 16

MSSN 404	Fitness	Credit 1

MSSN 405	Societal	Credit 1

Discipline Electives

Credit 4

S. No.	Title of the Course
1.	Fatigue, Injuries and Rehabilitation
	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.
	<u>Unit II</u> 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
	<u>Unit-III</u> 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
	<u>Unit-IV</u> 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: (1) Shaun Phillips (2015) Fatigue in Sport and Exercise. Routledge, NY (2) Therapeutic Modalities for Musculoskeletal Injuries 4th Edition, Human Kinetics by Craig Denegar, Ethan Saliba, Susan Saliba, 2016 (3) Essentials of Athletic injury management 10th edition by William E. Prentice, Human Kinetics. (4) Clinical Sports Medicine Fifth Edition by Peter Brukner, Karim Khan, McGraw-Hill Education Australia,
	 2016 (5) Principles and Practice of Therapeutic Massage by Sinha, Jaypee Publishers (6) Textbook of Electrotherapy by Singh Jagmohan, Jaypee Publishers (7) 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.
2.	Essentials of Sports
	<u>Unit-I</u> What are Play, Game and Sports? Types of sports and recreational activities, Importance of free play and organizational games, Terminology: Sports Science and Physical Education, Health Related and Motor performance Related Fitness
	<u>Unit-II</u> 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.
	<u>Unit-III</u> Introduction to General Rules and Regulations of Selected Sports (Football, Field Hockey, Basketball, Volleyball, Cricket, Badminton, Tennis), Introduction to Playfields and Track Specifications, General Organizational Process of Sports Competitions.
	<u>Unit-IV</u> Health and Wellness (physical, mental, psychological, social and spiritual) and Athletics, Sports Careers: Media, Management, Performance, Coaching and other Related Areas.
	 Recommended Books: (1) Bucher, C.A.: Foundation of Physical Education, St. Louis: The C.V. Mosby company, 1983. (2) History and Philosophy of Sport and Physical Activity, Human Kinetics by R. Scott Kretchmar, Mark Dyreson, Matthew (3) Liewellyn, John Gleaves, 2017. Synder and Geoh: Professional preparation in Health Education, Physical
	 Education and Recreation. (4) Barrow, H.M.: Man and Movement: Principles of Physical Education, Philadelphia Lea and Fabiger, 1977. (5) Joseph, P.M.: Organisation of Physical Education, Kandivila,: Old students Association, T.I.P.E. (6) Kamlesh, M.L. and Sangral, M.S. : History and Principles of Physical Education, Prakash Brothers, 1983. (7) Wuest and Bucher: Foundations of Physical Education and Sports. B L. Publications Pyt. Ltd., New Delhi

	(8) William, H.F.: Physical Education and Sports in Changing Society, Surjeet Publication, Delhi.
3.	Kinanthropometry
	<u>Unit–I</u> 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.
	<u>Unit–II</u> 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.
	<u>Unit–III</u> Physiological Maturation: Decimal Age and concept of Physiological maturity in sports. Assessment of skeletal maturity of athletes, Importance in sports and various methods to estimate body composition.
	<u>Unit-IV</u> Somatotyping: Introduction, Definition of Somatotyping and Classification with special reference to sports.
	 Recommended Books: Sports Anthropemetry 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.
4.	Health Fitness and Wellness
	<u>Unit-I</u> Introduction to Health: Concept of health, Lifestyle and Disease, Ageing.
	<u>Unit-II</u> Physical Activities & Fitness: Concept to Fitness, Exercise and its Principles, Health Education Recreation & Dance.
	<u>Unit-III</u> Healthy Life Style Approach: Concept of Wellness, Wellbeing, Stress Management.
	<u>Unit-IV</u> Spiritual and mental fitness-its concept - anxiety management and motivation.
	 Recommended Books: (1) "Fitness and Wellness" : Warner W. K Hoeger and Sharvon A. Hoegor (2) "Fitness & Wellness concepts": Charles B. Corbina & Ruth Lindsey (3) "Lifetime Fitness & Wellness - A personal choice": Melvin H. Williams (4) Oxford Textbook of Public Health, Helen Liepman.
	 (5) Sunderlal, Aadarsh, Pankaj, 2007, Textbook of Community Medicine, CBS Publishers & Distributors. (6) Kirch, Wilhelm, 2008, Encyclopedia of Public Health, Volume 1 & 2, Kluwer Academic Publishers. (7) Mary -Jane Schneider and Henrey Schneider, 2006 (2nd edition), Introduction to Public Health, Jones and Bartlett Publishers.
5.	Research Methodology
	<u>Unit-I</u> 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
	<u>Unit-II</u> 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
	<u>Unit-III</u> Writing the Research Report: Completing the Research Process, Ways of Reporting Research, Introduction to review of literature, Evaluation of scientific literature; Tools of research- Questionnaires, opinionnaires, interviews and observation. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response

	 <u>Unit-IV</u> Organizing literature – strategies, use of software; Metaanalysis, Writing review – structuring the review, quoting/paraphrasing, the citation referencing system. Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Recommended Books: (1) Research Methodology: Methods and Techniques by C. R. Kothari. (2) ICMR. Ethical Guidelines for Biomedical Research on Human Subjects. 2006; ICMR, New Delhi. (3) Research Methods in Physical Activity- 7th Edition By Jerry Thomas, Jack Nelson, Stephen Silverman, Human Kinetics (4) Research Methods for Sports Performance Analysis By Peter O' Donoghue. (5) Research Methods in Physical Education and Youth Sport 1st Edition by Kathleen Armour and Doune Macdonald. (7) Ridley, D. The Literature Review a step-by-step guide for students. 2012; Sage Publications Limited, New Delhi.
6.	Assessment of Health and Fitness of Athlete
	Assessment of Physique; Kinanthropometry: Definition; Introduction; Body size and proportion; Somatotyping; Circumferences; Skinfold measurement sites and determining body composition; Applications. Body Composition and Performance: Factors that affect Body Composition; Assessment and Interpretation of Anthropometric and body composition data; Ideal Body Composition for Different Sports.Body Composition Assessment Techniques: Direct, Indirect and Doubly indirect (Under Water Weighing, Dexa, Whole Body Conductivity, Skin folds, Bioelectrical Impedance, Total Body Potassium, Near Infrared Interactance).
	<u>Unit-II</u> Dietary Assessment of Athletes: Different methods (food and fluid intake); Advantages and Disadvantages; Applications; Assessing food and fluid intake while traveling. Special issues with dietary assessment in sports: Diversity in intake; Training periodisation and food intake; Misreporting; Season and region specific dietary practices. Estimation of dietary intakes: Food data tables and software use;
	<u>Unit-III</u> Evaluation of Nutrient Adequacy of Athletes' dietary intake; Methods for assessing food and fuel intake among athletes; Types of dietary assessment tools (Validity and reliability among athletes); Special concerns in assessing food intake among athletes; Translating the dietary intake data into analysis and determining nutritional information. Assessment of Physical fitness: Functional tests; Cardiorespiratory and muscular assessment; Type of measurement and protocol for evaluation and interpretation of performance; Aerobic Power or VO2max; Anaerobic Threshold; Economy of Movement.
	<u>Unit-IV</u> Fitness assessment: Types of exercise, Components of physical fitness and its evaluation in health and performance. Activity Recording: Self-reporting of activities vs. Direct monitoring of activities. Biochemical and clinical assessment in sports: Assessment of Lipids, Protein, Vitamin and Mineral Status. Clinical Assessment: Signs and symptoms of various nutritional deficiencies. Assessment of Hydration: Estimation of sweat loss and sweat rate; urine volume and indicators of dehydration (Water, Urine and Thirst).
	 Recommended Books: Driskell, J. A., & Wolinsky, I. (Eds.). (2016). Nutritional assessment of athletes. CRC press. Eston, R., & Reilly, T. (Eds.). (2013). Kinanthropometry and exercise physiology laboratory manual: tests, procedures and data: volume two: physiology. Routledge.ACSM's Health-Related Physical Fitness Assessment Manual. H Aile, L., Agher Jr, G. A., Ael, M., & J Robertson, R. (2016). Perceived exertion laboratory manual. Springer New York. Heyward, V. H., & Gibson, A. (2014). Advanced fitness assessment and exercise prescription 7th edition. Human kinetics.
7.	Nutrigenomics
	<u>Unit I</u> Nutraceuticals in Functional Foods, Herbal products and Dietary Supplements Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition Nutraceuticals in Fruits and Vegetables, Nuts and Grains and their Health Benefits
	Unit II Introduction to Nutrigenetics and Nutrigenomics

	Nutraceuticals in Herbal Products and the Impact on Health
	Unit III Nutraceuticals and Disease Protection Good fats, bad fats. How they promote/protect from inflammatory diseases Anti-Inflammatory Nutraceuticals, Herbals and Digestive Aids Herbs and Nutraceuticals for Impotence and Sexual Performance Unit IV Nutraceuticals for Weight Loss, Anxiety, Insomnia and Depression Functional Food Development and Processing—Fate of Nutraceuticals
	Health Claims of Nutraceuticals & its regulations
	 Recommended Books: Journal Nutrients 2013, 5, 32-57; Nutrigenetics and Metabolic Disease: Current Status and Implications for Personalized Nutrition J Nutrigenetics Nutrigenomics 2011;4:69–89; Nutrigenetics and Nutrigenomics: Viewpoints on the Current Status and Applications in Nutrition Research and Practice. J Am Diet Assoc. 2006;106:569-576; Nutrigenomics: From Molecular Nutrition to Prevention of Disease. The Journal of Nutrition; Nutritional "Omics" Technologies for Elucidating the Role(s) of Bioactive Food Components in Colon Cancer Prevention. Nutrition 25 (2009) 1085–1093; Proteomics at the center of nutrigenomics: Comprehensive molecular understanding of dietary health effects.
8.	Food safety and Standardization
	Unit I: Food Laws and Standards in India: Food Safety and Standards (FSS) Act, 2006, FSS Rules and Regulations, Agricultural Produce Act, 1937 (Grading and Marketing) Export (Quality Control & Inspection), Act, 1963 and Rules d. Bureau of Indian Standards relevant to food safety e. Legal Metrology Act f. International Food Control Systems/ Laws, Regulations and Standards/ Guidelines with regard to Food Safety: CODEX (SPS/TBT), OIE, IPPC.
	Unit II: Principles of Food Preservation, Processing and Packaging, Labeling/Claims and Principles of Nutrition a. Food preservation and processing their principles, methodology and technology.
	Unit III: Principles of Packaging and various Food Packaging materials: rigid and flexible such as plastic films, metal containers, glass containers, paper and cardboard containers, jute containers, etc. Food microbiology, contamination, preservation and spoilage of different foods and storage studies of food products.
	Unit IV: Labelling requirements as per Food Safety Standards (Packaging and Labelling) Regulations,2011, Understanding of nutritional information as per the information. Food Hygiene and Sanitation, HACCP, FASSAI, Quality Control Tools, GLP, GHP, GMP and FSMS
9.	Adaptations to Exercise and Training
	<u>Unit-I</u> 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
	<u>Unit-II</u> Respiratory System Adaptations to Endurance and Strength Training, Ventilatory response to exercise and its use in sports, Ventilatory threshold, , 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.
	<u>Unit-III</u> Muscular Mechanisms in Aerobic Endurance Training; Muscle Molecular, Mechanisms in Strength Training, Muscle Property Changes in Strength Training,.
	<u>Unit-IV</u> Initial responses of the neuromuscular systems to exercise; Training Adaptation of the Neuromuscular System. Neuromuscular adaptations to Endurance training, Neural Mechanisms in Aerobic Endurance Training, Neural molecular changes in endurance training, Neural Mechanisms in Strength Training

Г		
		Recommended Books:
		(1) Roy J. Shephard and Henry S. Miller, Jr. (1999) Exercise and the Heart in Health and Disease. Marcel
		Dekker.
		(2) Shephard, R.J. and Astrand, PU. (1992) Endurance in sport. Blackwell Science Ltd, USA.
		(3) MCArdie, W.D., Kalch, F.I., Kalch, V.L. (2006) Essentials of Exercise Physiology. Lippincout williams and
		Wilkins, USA.
		 (4) VICIOF F. Froencher, Jonathan Myers (2000) Exercise and the heart. Elsevier Inc. (5) Christopher B. Cooper and Thomas W. Storer (2004) Exercise testing and interpretation. A practical
		(5) Christopher B. Cooper and Thomas W. Storer (2004) Exercise testing and interpretation- A practical
		(6) K Wasserman I Hansen D Sue W Stringer B Whinn eds (2004) Principles of Exercise Testing and
		Interpretation 4th edn Lippincott Williams & Wilkins Philadelphia USA
		(7) Christopher Ball Cardiovascular Physiology in Exercise and Sport 1st Edition 2008: Churchill Livingstone
		(7) Christopher Ben. Cardiovascular Physiology in Exercise and Sport. 1st Edition. 2008, Churchin Livingstone.
		(8) Michael G. Levitzky. Pulmonary Physiology, 8e. 2015; Lange. The MicGraw-Hin Companies.
		(9) Denise L. Smith and Bo Fernhall (2011) Advanced cardiovascular exercise physiology. Human Kinetics.
ł	10.	Therapeutic Sports Nutrition
		<u>Unit I</u>
		Athletes with Nutrition related disorders: Causes and consequences; Physiological effects of exercise;
		Pathophysiology; Medical Nutrition Therapy, Dietary guidelines and Nutrient timing of Diabetes, Hyperinsulinemia
		and Hypoinsulinemia, Cardiovascular disease, Osteoporosis, Sports Anaemia, Gastrointestinal disorders, Food allergies
		Food intolerance; Intermittent diarrhoea; Constipation; Food related adverse reactions (FRAR); Gut trainability; Lower
		GI tract conditions; irritable Bowel Syndrome, Coeliac disease; inflammatory bowel disease, FODMAP diet
		Unit II
		Nutrition for Special groups, Special Needs and Sports injuries; The Paralympic Athlete: Body composition
		assessment and management; Eating difficulties and behaviours, Dietary intakes and potential issues; Reported dietary
		intakes; Fibre timing of food intake and bowel control; Fluid intake; Medicine requiring Therapeutic Use Exemption
		(TUE) under WADA; Use of vitamin, mineral or sports supplement; Children and adolescent athletes: Growth and
		development; Nutritional issues; Eating habits and addiction; Nutritional requirements for growth and training;
		<u>UIII III</u> Female athletes: Vulnerability to nutrition assault and insufficiency: Differences in nutrient utilisation: Female athletic
		triad (FAT): energy availability and its association with FAT: Assessment for FAT: Dietary guidelines for FAT
		Vegetarian athletes: Nutritional status and dietary considerations: Nutritional gaps currently identified and suitable
		dietary modification for fuelling during training, competitions and traveling.
		<u>Unit IV</u>
		Nutrition for extreme environmental conditions; Altitude: Altitude training and Physiology; Dietary recommendations
		at varied altitudes; Common Nutritional problems faced by athletes at high altitude. Cold and Heat: Effect of Cold/Hot
		environment on dietary habits and recommendations for training and competing in cold/Hot environments; Effects of every strategies timing of water and electrolyte consumption during extreme
		climatic conditions. Replacing fluid and electrolytes
		ennane conditions. Replacing fund and electrorytes.
		Recommended Books:
		(1) Burke, Louise, and Vicki Deakin. (2015). Clinical sports nutrition. McGraw-Hill.
		(2) Broad, E. (Ed.). (2014). Sports Nutrition for Paralympic Athletes. CRC Press.
		(3) Maughan, R. J., & Shirreffs, S. M. (Eds.). (2013). Food, Nutrition and Sports Performance III. Routledge.
		Campbell, B. (Ed.). (2013). Sports nutrition: enhancing athletic performance. CRC Press.
		 (4) Larson-Meyer, D. E. (2007). Vegetarian sports nutrition. Human Kinetics. (5) Maxia Durford. (2017) Nutrition for Sport and Engenies.
		(5) Marie Duniord. (2017) Nutrition for Sport and Exercise. (6) LeMure I. M. & Von Duvillerd S. P. (Eds.) (2004) Clinical avaraisa physiology: application and
		(b) Lewida, L. M., & Von Duvinaru, S. F. (Eds.). (2004). Chinear exercise physiology. application and
		(7) Cheung, S. (2010). Advanced environmental exercise physiology. Human Kinetics.
ľ	11.	Food Psychology and counseling
		<u>Unit-I</u>
		Important concepts in Sports Psychology Mativation, Definition, Interactional approach, Coal acting, Strategies to aphance motivation, Coal
		orientation: Reinforcement: Positive approach: Intrinsic and Extrinsic motivation: Mental preparation
		orientation, reminicement, i ostave approach, maniste and Examiste motivation. Mental preparation.
		Attention Concept and Thought management: Definition; Ways in which athletes lose concentration;
		Concentration principles and thought management strategies.
		Management of competitive stress and athletes' responses: Relationship between anxiety and sports
		performance; Stress management intervention; Restructuring approach; Tools to Assess stress among athletes;
		mental preparation.

	I init-II
	Important concepts in Food psychology Effect of psychology on eating behavior and food choices: Models of food choices; Neuropsychology and food choices; Food choices across life span.
	Biological and Learning Influences on Food Choice: Biological influences on energy intake; Food Neophobia in humans; Role of learning in development of food preferences; Mood, Emotions and Food choice; Food cravings and Addictions.
	Societal Influence on Food Choice: Marketing parameter and their Influence on consumer food choice; Role of context in food choice; Food acceptance and Food consumption; Impact the media on food choice; Impact of advertising on food choice.
	Concepts of Health Behavior change psychology Theories of behavior change-Part A: Usefulness of theories in behavior change; health Belief Model; Theory of Reasoned Action/ Theory of Planned Behavior Self –Efficacy; The Trans theoretical Model.
	Theories of behavior change-Part B: Self –Determination Theory; Motivational Interviewing; Social Cognitive Theory; Dual –Process Models; Social Supports/ Social Networks; Diffusion of Innovations; Ethics of Behavior Change.
	Behavior modification strategies to influence eating habits and health outcomes: Impacts of optimistic bias on dietary behavior; Implementation intentions; Strategic Automatization of food choice; Use of the stages of Change Model with dietary behaviors; Addictive behavior assessment and strategies to overcome, General behavioral assessment and psychological testing tools.
	Unit-IV Nutrition counselling and education
	Nutrition counselling: Definition; Requirement; Procedures to adopts; Role of a Sports Dietition and theories and strategies to be adopted in nutrition counselling.
	Computer applications and protocols for nutrition counselling: Counselling session for individual athlete, for team,
	for coaches and other supporting staff. Models of health and nutrition education in sports person : Definition; Tools useful for education; Strategies for effective nutrition education.
	 Recommended Books: (1) Shepherd, R., & Raast, M. (Eds.). (2006). The psychology of food choice (Vol. 3). Cabi (2) Tenenbaum, G., & Eklund, R. C. (Eds.), (2007). Handbook of sport psychology. John Wiley & Sons (3) Lunelli, J. K., & Reed, D D. (Eds.), (2011) Behavioural sport psychology: Evidence-based approaches to performance enhancement. Springer Science & Business Media.
10	
12.	Nutritional Biochemistry
	<u>Unit-I</u> The Biochemical Basis of Exercise and Sports, Biochemistry of Performance of Various Sporting Events- The Weightlifter, Sprinter, Middle Distance Events and The Endurance Athlete, Adaptation to Training, Effects of Detraining.
	<u>Unit-II</u> Fundamentals of Nutritional Biochemistry, Various Classes of Nutrients and Their Role in Human Body, Basics of Energy Use in Body, Daily Energy Expenditure, Basic Metabolic Rate, Food Sources of Nutrients, Nutrient Digestion and Absorption, Nutrient Toxicities, Free Radicals and Anti-oxidants.
	<u>Unit-III</u> Role of Nutrition in Sports Performance of Various Sports Events Nutritional effect on Training Adaptation, Determining Energy Needs for Persons Involved in Various Exercise and Sports Activities, Proportion of Different Nutrients During Various Exercise/Sports, Hydration During Workouts, Dietary Recommendations for Different Sports.
	<u>Unit-IV</u>
	Recommended Books:
	(1) The Biochemical Basis of Sports Performance- Ronald J Maughan and Michael Gleeson (2010) Oxford University Press, ISBN:9780199208289.

	(2) Biochemistry for Sports and Exercise Metabolism- Don MacLaren, James Morton, (2011) Wiley-Blackwell
	Publisher, ISBN-978-0-470-09185-2. (3) Fundamentals of Human Nutrition- Catherine Heissler, Hilary Powers (2015) Churchill Livingstone Elsevier,
	ISBN:9780443069727.
	(4) Nutrition Chemistry and Biology- by Julian F. Spallholz and Mallory Boylan (1998), CRC Press, ISBN 13: 978-0849385049
	(5) Brooks, GA; Fahey, TD; Baldwin KM/Exercise physiology: human bioenergetics and its applications/Fourth
	Edition/2005.
13.	Exercise Physiology
	Unit I
	Introduction to Exercise and Sport Physiology, Structure and Function of Exercising Muscle, Fuel for Exercise: Bioenergetics and Muscle Metabolism
	<u>Unit-II</u> The Cardiovascular System and Its Control, Electrophysiology of Heart, Introduction and interpretation of EKG/ECG, Pacemakers and its Rhythms
	<u>Unit-III</u> The Respiratory System and Its Regulation, Cardiorespiratory Responses to Acute Exercise, Energy Expenditure and Fatigue
	Unit-IV
	The neural system and its regulation, Neural responses to acute and chronic exercise.
	Recommended Books:
	(1) Physiology of Sport and Exercise 6th Edition with Web Study Guide-Loose-Leaf Edition by W. Larry
	(2) Physiological Aspects of Sport Training and Performance With Web Resource - 2nd Edition, Human Kinetics
	By Jay Hoffman (2) Example 2 Division of Application to Eitrase and Deformance 10th Edition Dr. South Devenue and
	(3) Exercise Physiology: Theory and Application to Fitness and Performance 10th Edition By Scott Powers and Edward Howley 2018.
	(4) Exercise Physiology: Nutrition, Energy, and Human Performance 8th Edition by William D. McArdle, Frank
	 (5) Laboratory Manual for Exercise Physiology 2nd Edition. With Web Study Guide, Human Kinetics by G. Gregory Haff Charles Dumke 2018
	 (6) A Textbook of Sports & Exercise Physiology by Dey Swapan Kumar, Jaypee Publishers (7) Practical ECG for Exercise Science and Sports Medicine by Greg Whyte, Sanjay Sharma, Human Kinetics, 2010
	 (8) Physiological Tests for Elite Athletes 2nd Edition by Australian Institute of Sport Rebecca Tanner, Christopher Gore, 2012.
	(9) ACSM's Guidelines for Exercise Testing and Prescription, 10th Edition by American College of Sports Medicine. Wolters Kluwer, 2017
	(10) Recovery for Performance in Sport by Institut National du Sport de l'Expertise et de la Performance INSEP, Human Kinetics, Christophe Hausswirth, A. Mujika
	(11) A Textbook of Sports & Exercise Physiology by Swapan kumar Dey, Jaypee brother, 2012.
14.	Statistics for Sports Science
	Unit-1 Introduction to Biostatistics, Frequency Distribution, Variable and Attribute, Line-diagram, Bar-diagram, Pie chart, Histogram, Mean, Median and Mode. Data, its types and collecting measures. Statistical processes, their importance and uses in research.
	<u>Unit-II</u> Variance, Standard deviation; Standard error of mean, Null hypothesis, Level of significance and Probability; Regression and correlation. Normal probability curve and grading scales. Sampling Techniques- Probability and non- probability. Reliability and validity test.
	Unit-III Student's t-test, Fisher's t-test, Chi-square test, Analysis of Variance (ANOVA), ANCOVA, Mann whitney U test, test of concordance and Krushal wailles test. Application of parametric and non-parametric statistical techniques in research.
	Unit-IV Introduction and Application of Statistical Software. Computer applications- statistical packages for data analyses- SPSS, e-mail, search engines and Microsoft office. Recommended Books:

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

• Any other Elective Courses introduced from time to time will be included in the Discipline Elective (DE) of the M.Sc. Programme.