School of Sports Sciences
Department of Sports Bio-Sciences

Proposed Syllabus for

M.Sc. in Sports Nutrition

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

School of Sports Science
Department of Sports Bioscience
Course structure for M. Sc. Sports Nutrition

SEMESTER-I

Code	Title of course	Type of course	Credits
MSSN 401	Human Anatomy and Exercise Physiology	C1	4
MSSN 402	Food and Nutrition in sports	C2	4
MSSN 403	Kinesiology & Biomechanics	C3	4
MSSN 404	Sports Biochemistry	C4	4
MSSN 43x	Discipline Elective I	DE1	3
MSSN 405	Practicum I	P1	2
MSSN 406	Practicum II	P2	2
MSSN 407	Societal/Fitness		1
			24

SEMESTER-II

Code	Title of course	Type of course	Credits
MSSN 408	Principles and Methods of Sports Training	C5	4
MSSN 409	Sports Medicine & Psychology	C6	4
MSSN 410	Kinanthropometry	C7	4
MSSN 43x	Discipline Elective II	DE2	3
MSSN 43x	Discipline Elective III	DE3	3
MSSN 411	Minor dissertation	AECC1	4
MSSN 412	Practicum III	P3	2
			24

SEMESTER-III

Code	Title of course	Type of course	Credits
MSSN 501	Dietary supplements & Ergogenic aids	C8	4
MSSN 502	Sports specific nutrition	C9	4
MSSN 503	Research methodology, Entrepreneurship & Ethics	C10	2
MSSN 504	Internship	AECC2	4
MSSN 53x	Discipline Elective IV	DE4	3
MSSN 53x	Open Elective I	NDSE1	3
MSSN 505	Practicum IV	P4	2
MSSN 506	Practicum V	P5	2
			24

SEMESTER-IV

Code	Title of course	Type of course	Credits
MSSN 53x	Discipline Elective V	DE5	3
MSSN 53x	Discipline Elective VI	DE6	3
MSSN 53x	Open Elective II	NDSE2	3
MSSN 507	Major Dissertation		15
			24

Discipline electives offered by the department

1. Sports Nutrition for Performance Excellence
2. Biosensors for sports
3. Implications for Metabolism in Exercise
4. Applications of Nutraceuticals and Functional Foods in health
5. Statistics for Sports Science
6. Nutrition counselling and education
7. Biochemical Aspects of Health in Sports
8. Introduction to Sports and Sports Science
9. Communication skills and scientific writing of Sports Science
10. Adaptations to Exercise and Training
11. Drugs and Doping in Sports
12. Medical Biochemistry
13. Nutrition for resistance and power sports
14. Exercise Nutrition and metabolism
15. Therapeutic nutrition
16. Women health and exercise
17. Nutrition for resistance and power sports
18. Diet planning for special groups
19. Food hygiene and management
20. MOOC courses: - Courses may be offered by the department from the list of courses made available online before beginning of the semester as per suitability of the M. Sc. Program.

* The subjects in the given list for DSE may change whenever required.
** The content will depend upon recent developments in the area.

Non Discipline Specific Electives (NDSE): As offered by the other departments of the University.

S. No.	Course type	No. of course	Credits for each course	Total credits
1	Core course (Theory)	10	04 (02 credits for a course)	38
2	Core course (Laboratory)	05	02	10
3	DSE	06	03	18
4	NDSE	02	03	06
5	AECC	02	04	08
6	Dissertation	01	15	15
7	Fitness/Societal	01	01	01
			Total credits	**96**

Semester- I

Course Title: Human Anatomy and Exercise Physiology		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	04

Course Pre-requisite:

Course Objectives: To develop understanding about the fundamentals of human anatomy and exercise.

Course Outcomes:

- Students will be able to identify and understand all the systems of the human body.
- Improved understanding on the mechanisms of working of various organ- systems of the human body.
- They will be able to understand the integrated functions of all systems and the grounding of sports science in physiology, for which they can have practical implementations.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
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.	15
Unit-II	Anatomy and Physiology of: Nervous System, Special Senses, Endocrine System, Musculoskeletal system and acute effects of exercise on Nervous, Endocrine, and Musculoskeletal systems	15
Unit-III	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.	15
Unit-IV	Anatomy and Physiology of: Reproductive System, and Integumentary System and acute effects of exercise on Reproductive System, and Integumentary System	15
	Total hours	60

Examination

	Type of Assessment	**Syllabus covered**	**Marks**
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-III & Unit-IV	20
Part-C	End Semester examination	Unit-I , II , III & Unit-IV	60
	Total		**100**

Reference books

1. Marieb, E. N., & Keller, S. M. (2019). Essentials of Human Anatomy & Physiology, Global Edition. Pearson
2. Tortora, G. J. (1997). Introduction to the Human Body: The Essentials of Anatomy and Physiology. United Kingdom: Wiley.
3. Singh, I. B. (2007) Textbook of Anatomy with Coloured Atlas.Jaypee
4. Guyton, A. C., & Hall, J. E. (1986). Textbook of medical physiology (Vol. 548). Philadelphia: Saunders.
5. Tortora, G. J., & Nielsen, M. (2017). Principles of human anatomy. John Wiley & Sons.
6. Standring, S., Ellis, H., Healy, J., Johnson, D., Williams, A., Collins, P., & Wigley, C. (2005). Gray's anatomy: the anatomical basis of clinical practice. American journal of neuroradiology, 26(10), 2703.
7. Chatterjee's, C. C. (2017). Human physiology.
8. Chowdhary S. K. (2016) Concise medical physiology.
9. Netter, F. H. (1990). Atlas of Human Anatomy/Frank H. Netter. East Hannover, New Jersey, 592.

e-Recourses

Course Title: Food & Nutrition in Sports		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	04

Course Pre-requisite: Students should have basic knowledge of organic and biomolecules and some of the functional groups and stereochemistry

Course Objectives:

- To develop concepts about nutrition, nutrients (both macro & micro) and energy generation
- To understand personalized nutrition, diet planning and softwares employed

Course Outcomes:

- Students will be familiar with the structure, composition and nutritional role of food groups.
- Improved knowledge about different aspects of nutrients in sports training, immunity and adaptation.
- Students will be able to interpret and apply nutritional concepts to evaluate and improve the nutritional health of sports persons.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Nutrients and nutritional Role of macro and micro nutrients: Water Requirements and Fluid Balance, Nutrition Supplements. Gastric Emptying, Digestion, and Absorption	15
Unit-II	Nutrients: Functions and Recommended Intakes, Healthy Eating and Balanced Diet, Fuel Sources for Muscle and Exercise Metabolism, Energy: Food Energy and Expenditure	15
Unit-III	Nutrition and Immune Function in Athletes, Body Composition and Weight Management, Eating Disorders in Athletes	15
Unit-IV	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	15
	Total hours	60

Examination

	Type of Assessment	**Syllabus covered**	**Marks**
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-III & Unit-IV	20
Part-C	End Semester examination	Unit-I , II , III & Unit-IV	60
		Total	**100**

Reference books

1. David, L., Nelson, D. L., Cox, M. M., Stiedemann, L., McGlynn Jr, M. E., & Fay, M. R. (2000). Lehninger principles of biochemistry.
2. Voet, D., Voet, J. G., & Pratt, C. W. (2018). Voet's Principles of Biochemistry. Wiley Global Education.
3. Poortmans, J. R. (Ed.). (2004). Principles of exercise biochemistry.Karger Publishers.
4. Berg, J. M., Stryer, L., Tymoczko, J. L., & Gatto, G. J. (2015). Biochemistry: Macmillan Learning.
5. West, E. S., & Todd, W. R. (1955). Textbook of Biochemistry: Macmillan.
6. Talwar, G. P., & Srivastava, L. M. (2002). Textbook of biochemistry and human biology: Phi Learning.
7. S, S., Vasudevan, D., Vaidyanathan, K. (2019). Textbook of Biochemistry for Medical Students. India: Jaypee Brothers Medical Publishers Pvt. Limited.
8. Jain, J. L. (2004). Fundamentals of Biochemistry. India: S. Chand Limited.
9. Comprehensible Viva and Practical Biochemistry. (2013). India: New Central Book Agency (P) Limited.

e-Recourses

Course Title: Kinesiology & Biomechanics		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	**04**

Course Pre-requisite: Students should have basic knowledge of organic and biomolecules and some of the functional groups and stereochemistry

Course Objectives:

- To study about kinetic and kinematics concepts for analyzing human movements, linear and angular kinematics of human movement.
- To provide the knowledge of linear and angular kinetics as applied to human movement.
- To provide the basic concepts of Kinesiology and importance of Kinesiology in sports.
- To study the structure, function, and significance of various connective tissues with the understanding of the human body movements and neuromuscular functions.

Course Outcomes:

- Describe the kinematics of projectile motion and factors influencing projectile trajectory.
- Identify, analyze, and solve various biomechanical problems.
- Demonstrate an understanding of kinetic concepts including inertia, force, torque, and impulse. Define Newton's laws of physics and to identify the steps involved in finding the Centre of gravity
- Identify the major factors involved in the angular kinematics of human movement.
- Improved understanding of structure, function of neuromuscular system and the rationale of some musculoskeletal exercise, increase the joint flexibility.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	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. 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.	15
Unit-II	Movement patterns – the essence of sports biomechanics, Qualitative analysis of sports movements, Structure of Motor Action: Definition of motor action, Classification: types of movements i.e., acyclic, cyclic and movement combination Phases of movement and their importance, Structure of acyclic, cyclic and movement combination with examples and function of various phases. Image analysis in sports performance errors in motion analysis, planar Video analysis, 3d motion analysis, data filtering.	15
Unit-III	Definition of Kinesiology, Its importance in the field of Sports Reference System for Movement Analysis: Concept of reference system and its significance Various references, centre of gravity, Mechanical Axis, Anatomical and Standard standing position, Types of Planes and Axes	15
Unit-IV	Fundamental and Auxiliary Movements: Definition and explanation of various fundamental and auxiliary movements: flexion, extension, hyper extension, abduction, adduction, hyper adduction, lateral flexion, rotation, pronation, supination, planter flexion, dorsiflexion, inversion, eversion, and circumduction	15
	Total hours	60

Examination

	Type of Assessment	**Syllabus covered**	**Marks**
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-III & Unit-IV	20
Part-C	End Semester examination	Unit-I , II , III & Unit-IV	60
	Total		**100**

Reference books

1. Loudon, J. K., Reiman, M. P., Manske, R. C. (2013). Clinical Mechanics and Kinesiology. United Kingdom: Human Kinetics.
2. Yessis, M. (2013). Biomechanics and Kinesiology of Exercise. United States: Ultimate Athlete Concepts.
3. Norkin, C. C., Levangie, P. K. (1983). Joint Structure & Function: A Comprehensive Analysis. United States: F.A. Davis
4. Bertoti, D. B., Houglum, P. A. (2012). Brunnstrom's Clinical Kinesiology. United States: F.A. Davis
5. Rasch, P. J., Garhammer, J., Gregor, R. J., Grabiner, M. D. (1989). Kinesiology and Applied Anatomy. United Kingdom: Lea & Febiger.
6. Shaw, D. (2007). Pedagogic Kinesiology. India: Sports Publication.
7. Floyd, R., Thompson, C. W. (2017). Manual of Structural Kinesiology. United Kingdom: McGraw-Hill Education.
8. Biomechanics and Kinesiology of Human Motion. (2009). India: Khel Sahitya Kendra.
9. Panjabi, M. M., White, A. A. (1990). Clinical Biomechanics of the Spine. United Kingdom: Lippincott.

	10. Kapandji, I. A. (1970). The Physiology of the Joints ... Vol. 1. United Kingdom: (n.p.). 11. Luttgens, K., Hamilton, N. P., Weimar, W. (2012). Kinesiology: Scientific Basis of Human Motion. United Kingdom: McGraw-Hill. 12. Hall, S. J. (1991). Basic Biomechanics. United States: Mosby.
e-Recourses	

Course Title: Sports Biochemistry		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	**04**

Course Pre-requisite: Students should have basic knowledge of organic and biomolecules and some of the functional groups and stereochemistry

Course Objectives:

- To develop concepts about structures and functions of different biomolecules.
- To understand the reactivity of biomolecules and their role in metabolic pathways.

Course Outcomes:

- The student would be able to recall various biomolecules, their structures and functions.
- Improved understanding of bioenergetics in human body.
- The students will be able to recall the important catabolic and anabolic metabolic pathways and their regulation.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	**Foundation of Biochemistry:** Introduction to Biomolecules; **Properties of water**: Structure and properties of water, importance of water in biological systems, Ionic product of water; **Chemical bonding**: Properties of covalent bond, non-covalent bonds and their importance in biological systems; **Types of biochemical reactions**: oxidation, reduction, condensation, rearrangement, cleavage, group transfer, Resonance bond, electrophilic and nucleophilic	15
Unit-II	**Carbohydrates:** Classification, characteristics, structure and functions of monosaccharides, disaccharides, trisaccharides and polysaccharides; amino sugars, proteoglycans and glycoproteins.; **Lipids**: Classification, structure and function of major lipid subclasses- Triacylglycerols, Phospholipids, Sphingolipids, glycolipids, Lipoproteins, chylomicrons, LDL, HDL and VLDL, steroids, prostaglandins and bile acids, rancidity.	15
Unit-III	**Protein**: **Amino acids:** Structure, Classification, and physico-chemical properties of amino acids, role of non-protein amino acids, peptides, peptides of physiological significance, peptide bond.; **Proteins:** Structural features of proteins and their biological Functions- Primary Structure, Secondary structure, Tertiary Structure and Quaternary structure.	15
Unit-IV	**Nucleic acids**: Structure and properties of nucleotides, nucleosides, purine (Adenine, Guanine) and pyrimidine (Cytosine, Thiamine, Uracil) bases. Structural features of nucleic acids (DNA & RNA) and their biological functions.; **Vitamins:** Structure and Classification, water soluble and fat soluble vitamins	15
	Total hours	60

Examination

	Type of Assessment	**Syllabus covered**	**Marks**
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-III & Unit-IV	20
Part-C	End Semester examination	Unit-I , II , III & Unit-IV	60
	Total		**100**

Reference books	
	1. David, L., Nelson, D. L., Cox, M. M., Stiedemann, L., McGlynn Jr, M. E., & Fay, M. R. (2000). Lehninger principles of biochemistry. 2. Voet, D., Voet, J. G., & Pratt, C. W. (2018). Voet's Principles of Biochemistry. Wiley Global Education. 3. Poortmans, J. R. (Ed.). (2004). Principles of exercise biochemistry.Karger Publishers. 4. Berg, J. M., Stryer, L., Tymoczko, J. L., & Gatto, G. J. (2015). Biochemistry: Macmillan Learning. 5. West, E. S., & Todd, W. R. (1955). Textbook of Biochemistry: Macmillan. 6. Talwar, G. P., & Srivastava, L. M. (2002). Textbook of biochemistry and human biology: Phi Learning. 7. Vasudevan, D. M., Sreekumari, S., & Vaidyanathan, K. (2019). Textbook of biochemistry for medical students. Jaypee brothers Medical publishers. 8. Jain, J. L. (2004). Fundamentals of Biochemistry. India: S. Chand Limited 9. Deb, A. C. (2013). Comprehensible viva and practical biochemistry. New Central Book Agency.
e-Recourses	

Practicum - I	
Details of the unit	**Hours allotted**
<u>For all</u> • Introduction to laboratory techniques and good laboratory practices. • How to Use microscopes. • 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. **<u>For M.Sc Sports Biochemistry</u>** • 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, and) • Calculation of Energy expenditure • Measurement of blood glucose • Measurement of blood Lipid Profile • Biochemical Assessment of Metabolites (Lactate and Urea).	30

Practicum - II	
Details of the unit	**Hours allotted**
<u>For all</u> • 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. **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	30

Semester - II

Course Title: Principles and Methods of Sports Training

Teaching Scheme	Examination Scheme	Credits Allotted
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	**04**

Course Objectives:

- To gain knowledge about basics of sports training.
- To understand about the organization of Sports Training.
- To gain knowledge about physical activity, health and fitness.
- Study about training plans and their execution.

Course Outcomes:

- Various Improved understanding of the principles, structure and adaptations of training.
- Improved understanding about health and its components.Students will be able to plan various kind of training for competition.
- Improved understanding of sports training.
- Improved understanding of the principles, structure and adaptations of training.

Course Content:

Unit no	Details of the unit	Hours allotted
Unit-I	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	15
Unit-II	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.	15
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.	15
Unit-IV	Training plan; Need for and importance of 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	15
	Total hours	60

Examination

	Type of Assessment	Syllabus covered	Marks
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-III & Unit-IV	20
Part-C	End Semester examination	Unit-I , II , III & Unit-IV	60
	Total		**100**

Reference books

1. Costill, D. L., Kenney, W. L., Wilmore, J. H. (2016). Physiology of Sport and Exercise. United States: Human Kinetics.
2. Buzzichelli, C., Bompa, T. O. (2019). Periodization: Theory and Methodology of Training. United Kingdom: Human Kinetics.
3. Hoffman, J. (2014). Physiological Aspects of Sport Training and Performance. United States: Human Kinetics.
4. Hausswirth, C., & Mujika, I. (2013). Recovery for performance in sport. United Kingdom: Human Kinetics.
5. Haff, G. G., & Triplett, N. T. (Eds.). (2015). Essentials of strength training and conditioning 4th edition. Human kinetics.
6. Singh, H. (1991). Science of sports training. New Delhi: DVS Publication,
7. Matveyev, L. (1982). Fundamentals of Sports Training. (n.p.): Victor Kamkin.
8. Harre, D., & Brahms, M. (2012). Principles of Sports Training. Germany: Ultimate Athlete Concepts.
9. Singh, H. (1984). Sports training: general theory & methods. Netaji Subhas. Nat. Inst. of Sports.
10. Scholich, M. (1991). Circle-Training. Berlin: Sportverlag.
11. Wilmore, J. H. (1977). Athletic training and physical fitness: physiological principles and practices of the conditioning process. Boston: Allyn and Bacon.

e-Recourses

Course Title: Sports Medicine and Psychology		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 3 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	**04**

Course Pre-requisite:

Course Objectives:

- To gain knowledge about use of medicine in sports and progress of aspects of psychology in modern era

Course Outcomes:

- Development of basic concepts of sports medicine
- To gain knowledge about recent developments in sports psychology and association with medicine

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Segmental Stabilization Concepts of Spine a. Muscle function in spinal stabilization b. Contribution of various muscles to spinal stabilization c. Local Muscle dysfunction in Low back pain d. Principles of clinical management of deep muscle system for segmental stabilization Emergency Medical Planning and cover for Sports Events Treatment of collapsed athlete Severe head injury The athlete with spinal injury Chest injuries Abdominal injuries Injuries to the extremities Causes of Collapse Exercise for growing bones, Effect of Physical activity intervention in youth Cardiac Adaptations Exercise and the skeleton Respiratory adaptations of athletes to exercise Training induced adaptation in skeletal muscles	15
Unit-II	Precision heart rate training a. Heart rate monitoring and training b. Training in heart zones c. Precision heart rate training for specific sports d. Multi Activity training e. Monitoring of training effects. Current concepts in obesity management a. Childhood obesity etiology and role of exercise b. Obesity correlation with lipidogram c. Intra-abdominal obesity hazards d. Management of obesity	15
Unit-III	Electromyography and Rehabilitation a. Principles of EMG Rehab b. Muscular tone, fatigue and neural influences c. EMG in the evaluation of Sports Trauma Hyperthermia and Shockwave: New methods in the treatment of Sports injuries. History and current status of Sports Psychology.Personality Assessment and sports personality. i. Theories of personality, ii. Personality assessment • Attention and perception in sports. i. Attention, ii. Perception, Concentration training in sports.	15
Unit-IV	iii. Basic principles of concentration, iv.Concentration training, v. Concentration awareness exercises. Motivational orientation in sports. vi. Athlete's needs of motivation,vii. Motivational inhibitors, viii. Motivational techniques • pre-competitive anxiety. a. Source of PCA, Relaxation Training. a. Definition b. Types of relaxation trainings, i) Progressive muscle relaxation, ii) Breathing exercises, iii) Yognidra, iv) Transcendental meditation • Aggression in sports. a. Theories of aggression b. Management of aggression• Role of Psychology in Dealing with injuries. • Eating disorders. a. Etiology of eating disorders, b. Types of eating disorders, c. Complications of eating disorders • Goal setting	15
	Total hours	60

Examination

Internal Assessment:

		Marks
Part-A	CIA –I Unit-I & Unit-II	20
	CIA –II : Unit-III & Unit-IV	20
Part-B		
	Assignments	
Part-C	End Semester examination	60
	Total	**100**

Reference books

1. Reid, D. C. (1992). Sports Injury Assessment and Rehabilitation. United Kingdom: Churchill Livingstone.
2. Brukner, P., & Brukner, K. K. (2017). Khan's clinical sports medicine: Volume 1 Injuries. North Ryde. McGraw Hill.
3. Torg, J. S., & Shephard, R. J. (1995). Current therapy in sports medicine. Mosby Incorporated.
4. Christine, M. D., (1999). Physiology of sports and exercise.USA: Human Kinetics.
5. Conley, M. (2000). Bioenergetics of exercise training. In T.R. Baechle, & R.W. Earle, (Eds.),
6. Haff, G. G., & Triplett, N. T. (Eds.). (2015). Essentials of strength training and conditioning 4th edition. Human kinetics.
7. David, R. M. (2005). Drugs in sports, (4th Ed). Routledge Taylor and Francis Group.

e-Recourses	

Course Title: **Kinanthropometry**		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	**04**

Course Pre-requisite:

Course Objectives:

Course Outcomes:

- Improved understanding of various kinanthropometric concepts.
- Students will be able to demonstrate practical skills in a range of anthropometric measurements and evaluations.
- Students will be able to safely and effectively use instrumentation and equipment to assess and record human anthropometry, physique and somatotype

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
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	15
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	15
Unit-III	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.	15
Unit-IV	Somatotyping: Introduction, Definition of Somatotyping and Classification with special reference to sports.	15
	Total hours	60

Examination

	Type of Assessment	**Syllabus covered**	**Marks**
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-III & Unit-IV	20
Part-C	End Semester examination	Unit-I , II , III & Unit-IV	60
	Total		**100**

Reference books

1. Sodhi, H. S. (1991). Sports Anthropometry: A Kinanthropometric Approach: Anova Publications.
2. Sodhi, H. S., & Sidhu, L. S. (1984). Physique and Selection of Sportsmen: A Kinanthropometric Study: Punjab Publishing House.
3. Singh, S. P., & Malhotra, P. (1989). Kinanthropometry. Lunar Publication, Patiala, 1989, 69-74.
4. Eston, R. G., & Reilly, T. (Eds.). (2001). Kinanthropometry and exercise physiology laboratory manual (Vol. 1). London: Routledge.
5. Singh, S. P., Singh, J., Sidhu, L. S. (1992). Skeletal Maturity: Growth Development and Physical Performance. India: Human Biology Publication Society, Punjabi University, Patiala.
6. Levine, L., Carter, J. E. L. (1974). Genetic and Anthropological Studies of Olympic Athletes. United Kingdom: Academic Press.

e-Recourses	

Practicum - III	
Details of the unit	**Hours allotted**
<u>For all</u> • 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.	30

Course Title: **Dietary supplements & Ergogenic aids**		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	**04**

Course Pre-requisite: Students should have basic knowledge of biomolecules, metabolism and physiology.

Course Objectives:

- To develop concepts about supplements, diet planning & its impact on sports performance
- To understand the dope control procedures and regulations in sports

Course Outcomes:

- The students shall be able to learn the role of common nutritional supplements in sportspersons.
- Review the beneficial effects of nutritional supplements in sportspersons.
- The students will be able to understand the effective use botanical ergogenic supplements

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	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 and Designer Anabolic Steroid Control Act; Adverse Event Regulation and Legislation; Contamination or Adulteration	15
Unit-II	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	15
Unit-III	Macronutrient and Micronutrient Supplements: Protein Supplements. CHO Supplements, Fat Supplements Vitamin Supplements, Multi-Vitamin Supplements. Mineral Supplements, Antioxidants Supplements	15
Unit-IV	Nutritional supplements in sports & exercise, Plants derived nutritional supplements, Animals derived supplements; Supplement administration & endocrinological responses: evaluation of hormones, effect on sports performance; Metabolite supplements, Dairy products, probiotics, prebiotics & synbiotics as supplements; Commercial products; Supplements and fueling in sports: case studies; Diet planning: concepts & case studies	15
	Total hours	60

Examination

	Type of Assessment	**Syllabus covered**	**Marks**
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-III & Unit-IV	20
Part-C	End Semester examination	Unit-I , II , III & Unit-IV	60
		Total	**100**

Reference books

1. David, L., Nelson, D. L., Cox, M. M., Stiedemann, L., McGlynn Jr, M. E., & Fay, M. R. (2000). Lehninger principles of biochemistry.
2. Voet, D., Voet, J. G., & Pratt, C. W. (2018). Voet's Principles of Biochemistry. Wiley Global Education.
3. Poortmans, J. R. (Ed.). (2004). Principles of exercise biochemistry.Karger Publishers.
4. Berg, J. M., Stryer, L., Tymoczko, J. L., & Gatto, G. J. (2015). Biochemistry: Macmillan Learning.
5. West, E. S., & Todd, W. R. (1955). Textbook of Biochemistry: Macmillan.
6. Talwar, G. P., & Srivastava, L. M. (2002). Textbook of biochemistry and human biology: Phi Learning.
7. S, S., Vasudevan, D., Vaidyanathan, K. (2019). Textbook of Biochemistry for Medical Students. India: Jaypee Brothers Medical Publishers Pvt. Limited.
8. Jain, J. L. (2004). Fundamentals of Biochemistry. India: S. Chand Limited.
9. Comprehensible Viva and Practical Biochemistry. (2013). India: New Central Book Agency (P) Limited.

e-Recourses

Course Title: Course Title: Sports Specific Nutrition		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory: 4
Practical: Not Applicable		Practical: 0
	Total	**04**

Course Pre-requisite: Students should have basic knowledge of organic and biomolecules and some of the functional groups and stereochemistry

Course Objectives:

- To develop concepts about nutritional requirements pertaining to various sports
- To understand the guidelines for proper fueling and energy replenishments in sports

Course Outcomes:

- The students will be able to plan diets of sportsperson based on the sports played.
- The students will be able to help athletes learn to adopt healthy food and fluid choices at the time of training and competitions.
- The students will be able to advise athletes on the safe use of nutritional supplements.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	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	15
Unit-II	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	15
Unit-III	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	15
Unit-IV	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.	15
	Total hours	60

Examination

	Type of Assessment	**Syllabus covered**	**Marks**
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-III & Unit-IV	20
Part-C	End Semester examination	Unit-I , II , III & Unit-IV	60
	Total		**100**

Reference books

1. David, L., Nelson, D. L., Cox, M. M., Stiedemann, L., McGlynn Jr, M. E., & Fay, M. R. (2000). Lehninger principles of biochemistry.
2. Voet, D., Voet, J. G., & Pratt, C. W. (2018). Voet's Principles of Biochemistry. Wiley Global Education.
3. Poortmans, J. R. (Ed.). (2004). Principles of exercise biochemistry.Karger Publishers.
4. Berg, J. M., Stryer, L., Tymoczko, J. L., & Gatto, G. J. (2015). Biochemistry: Macmillan Learning.
5. West, E. S., & Todd, W. R. (1955). Textbook of Biochemistry: Macmillan.
6. Talwar, G. P., & Srivastava, L. M. (2002). Textbook of biochemistry and human biology: Phi Learning.
7. S, S., Vasudevan, D., Vaidyanathan, K. (2019). Textbook of Biochemistry for Medical Students. India: Jaypee Brothers Medical Publishers Pvt. Limited.
8. Jain, J. L. (2004). Fundamentals of Biochemistry. India: S. Chand Limited

e-Recourses

Course Title: Research methodology, Entrepreneurship & Ethics

Teaching Scheme	Examination Scheme	Credits Allotted
Theory: 2 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory:2
Practical: Not Applicable		Practical: 0
	Total	**02**

Course Pre-requisite: Students should have basic knowledge of language & ethics

Course Objectives:

- To understand the basic concepts of research and scientific writing
- To identify the concepts of entrepreneurship & sports ethics

Course Outcomes:

- Understanding the theories, importance and applications of research in sports
- Comprehension of sports entrepreneurship, law and economics
- Develop the understanding about ethical issues in sports and their redressal

Course Content:

Unit no	Details of the unit	Hours allotted
Unit-I	Introduction to Research: definition, importance in research, critical features of research hypothesis and its types. Selection and formulation of research proposal: identification of problem, review of literature, statement of problem, development of hypothesis, Formulation of Methodology and concept. types of research: i) basic, applied, and action research, ii) quantitative and qualitative research, Tools of research, Scientific writing, Plagiarism, Parts of dissertation/ research report / articles Software and computer applications in research.	13
Unit-II	**Entrepreneurship:** Introduction: definition; types; classification; qualities of an entrepreneur; Project formulation; Evaluation and feasibility analysis; Celebrity Management; Digital & media marketing in Sports; Public relations in sports & business communication; Sports Law; Sports financial management; Sports analytics management **Ethics:** Sports ethics: introduction, institutional, personal; Standards in ethics; Bioethics, Nuremberg Code, Declaration of Helsinki, Principle of essentiality, informed consent, confidentiality, minimization of risk, accountability; Responsibility for observance of sports ethics: government, sports-related organizations, individual; National sports ethics commission bills.	17
	Total hours	**30**

Examination

	Type of Assessment	Syllabus covered	Marks
Part-A	**Internal Assessment:** CIA –I	Unit-I	20
Part-B	**Internal Assessment:** CIA –II	Unit-II	20
Part-C	End Semester examination	Unit-I & II	60
	Total		**100**

Reference books

1. Pedersen, P. M., Laucella, P., Kian, E., & Geurin, A. (2016). Strategic Sport Communication, 2E. Human Kinetics.
2. Abraham, C., & Kools, M. (2011). Writing health communication: An evidencebased guide. Sage.
3. Ciletti, D., & Chadwick, S. (2012). Sports Entrepreneurship: Theory and Practice.
4. Fitness information Technology.
5. Kuhse, H. (2010). Bioethics: an Anthology. Malden, MA: Blackwell.
6. Have, H., & Jean, M. (2009). The UNESCO Universal Declaration on Bioethics and Human Rights: Background, Principles and Application: UNESCO Publishing.
7. Indian Council of Medical Research. (2000). Ethical Guidelines for Biomedical Research on Human Subjects. New Delhi.
8. Schneider, R. C. (2021). Ethics of Sport and Athletics: Theory, Issues, and Application. Argentina: Wolters Kluwer.
9. Simon, R. L. (2016). The Ethics of Sport: What Everyone Needs to Know. United States: Oxford University Press.

e-Recourses

Practicum - IV	
Details of the unit	**Hours allotted**
• Planning a year round diet for an athlete with different clinical conditions. • Planning a year round diet for an athlete 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.	30

Practicum - V	
Details of the unit	**Hours allotted**
• 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.	30

Course Title: Sports Nutrition for Performance Excellence

Teaching Scheme	Examination Scheme	Credits Allotted
Theory: 3 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory:3
Practical: Not Applicable		Practical: 0
	Total	**03**

Course Pre-requisite: Students should have basic knowledge of biomolecules, metabolism and nutrition.

Course Objectives:

- To understand the importance of sensing technologies for the detection of key markers for sports performance
- To develop current state of the art to identify the biosensor work and design for sports applications

Course Outcomes:

- Understanding the diet, energy equivalence and role of macronutrients in sports
- Identify the role of climate and environment on sports performance
- Develop the understanding of specified nutrition regime for various sports & latest developments

Course Content:

Unit no	Details of the unit	Hours allotted
Unit-I	Sports nutrition: diet, performance & importance of sports nutrition; Absorption & energy Metabolism; Energy systems; Fuel for energy metabolism in exercise: effect of intensity and duration of exercise/sport; Measuring energy expenditure; Measuring physical activity – METs; Metabolic equivalent; Fatigue; Macronutrients- Carbohydrate, Protein, Fats in sport: during training, during different phases of preparation, general preparatory phase, specific preparatory phase, competition phase, transition phase, injury and rehabilitation phase, pre-competition & post-competition nutrition	15
Unit-II	Effect of Climate & Environment on sports performance; Dehydration & performance: Assessment of fluid loss, proper pre-hydration, rehydration / fluid replacement; Sweat; Thermoregulation; Electrolyte loss & exercise: maintaining / restoring electrolyte balance; Sports & energy drinks; Vegetarian athletes; Female athletes; Geriatric Sports nutrition; Age categorised sports, growth and nutrition; Nutrition for the differentially abled involved in sports	15
Unit-III	Nutrition for performance enhancement: Endurance sports - Nutrition for Ironman, Triathlon and Ultrathon - Nutrition for intermittent sports; Nutrition for strength & power sports; Nutrition for winter sports; Nutrition for weight conscious sports; Nutrition for martial artists in the Olympics - Judo, Wrestling, Wushu, Taekwondo; Nutrition for adventure sports, Kayaking, Canoeing, and other water sports; Nutrition in swimming. Sports Nutrition research - Latest advancements	15
	Total hours	**45**

Examination

	Type of Assessment	Syllabus covered	Marks
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-II & Unit-III	20
Part-C	End Semester examination	Unit-I , II & III	60
	Total		**100**

Reference books

1. Maughan, R. J. (Ed.). (2008). Nutrition in sport (Vol. 7). John Wiley & Sons.
2. Reaburn, P. R. (Ed.). (2014). Nutrition and Performance in Masters Athletes. CRC Press.
3. Eberle, S. G. (2013). Endurance Sports Nutrition, 3E. Human Kinetics.
4. Campbell, B. (Ed.). (2013). Sports nutrition: enhancing athletic performance. CRC Press
5. 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.
6. Ryan, M. (2012). Sports nutrition for endurance athletes. Velo Press.
7. Zinner, C., & Sperlich, B. (Eds.). (2016). Marathon running: Physiology, psychology, nutrition and training aspects. Cham: Springer.
8. Campbell, B. (Ed.). (2013). Sports nutrition: enhancing athletic performance. CRC Press.
9. Larson-Meyer, D. E. (2007). Vegetarian sports nutrition. Human Kinetics.
10. Dunford, M., & Doyle, J. A. (2021). Nutrition for sport and exercise. Cengage Learning.

e-Recourses

Course Title: Biosensors for Sports

Teaching Scheme	Examination Scheme	Credits Allotted
Theory: 4 hours /Week	Internal Assessment: 40 End Semester examination: 60	Theory:3
Practical: Not Applicable		Practical: 0
	Total	**03**

Course Pre-requisite: Students should have basic knowledge of organic and biomolecules and some of the functional groups and stereochemistry

Course Objectives:

- To understand the importance of sensing technologies for the detection of key markers for sports performance
- To develop current state of the art to identify the biosensor work and design for sports applications

Course Outcomes:

- Understanding the mechanisms of transducing elements, sensing and detection
- Design and develop bioanalytical devices / biosensor for sports performance evaluation
- Translational utility of sensor technology for sports

Course Content:

Unit no	Details of the unit	Hours allotted
Unit-I	Sensors: fundamentals, types and detection principles, calibration, selectivity, sensitivity, reproducibility, detection limits, response time; electrochemical sensors: amperometric, potentiometric, conductimetric; Chronoamperometry and Chronopotentiometry; Optical sensors: absorption, fluorescence, SPR; piezoelectric sensors; Thermal transducers; electronic sensors; modelling; economics; biosensors; techniques employed in fabrication of biosensors and detection of analytes; measurement principles; nanobiosensors; ambient sensors	15
Unit-II	Biomolecules as biosensors: enzymatic, immunosensors, aptamers, peptides and whole-cell; Biorecognition Systems: Enzymes; oligonucleotides and nucleic acids; lipids; membrane receptors and transporters; tissue and organelles (animal and plant tissue); cell culture, limitations and problems, immobilization of biomolecules; Design and Fabrication of Biosensors: Self-assembled mono layers screen printing, photolithography, micro-contact printing, MEMS, miniaturization-application of nano-materials, nanoparticles, carbon nanotubes (CNTs) and others; Bioelectric Tattoos; Wireless biosensor networks; biosensors in health and wellness monitoring	15
Unit-III	Biosensors for sports and athletes; Biosensors based detection in sports: fundamentals and kinetics; biodetection principles; biosensors for monitoring the respiration, hydration, stress and water:electrolyte ration in athletes; glucose sensors; lactate sensors; continuous glucose and lactate monitoring sensors; conductivity sensors; cortisol sensors; biosensors for monitoring the hormonal state of the athlete: sterone biosensors; actigraphy motion biosensors; Wearable sensors for sports: Accelerometer, gyroscope, magnetometer, heart rate sensors, pedometers; commercial sensors available for sports: types, fabrication principles, market, importance; smart clothing: e-textile system for remote, continuous monitoring of physiological and movement data; monitoring the mental acuity of athletes; monitoring the biochemical status of the athlete by detecting biomarkers from sweat and saliva; case studies	15
	Total hours	**45**

Examination

	Type of Assessment	Syllabus covered	Marks
Part-A	**Internal Assessment:** CIA –I	Unit-I & Unit-II	20
Part-B	**Internal Assessment:** CIA –II	Unit-II & Unit-III	20
Part-C	End Semester examination	Unit-I , II & III	60
	Total		**100**

Reference books

1. Sadana, N., Sadana, A. (2016). Handbook of Biosensors and Biosensor Kinetics. Netherlands: Elsevier Science.
2. Evtugyn, G. (2013). Biosensors: Essentials. Germany: Springer Berlin Heidelberg.
3. Herold, K. E. (2009). Biosensors and biodetection. A. Rasooly, & K. E. Herold (Eds.). Totowa, NJ: Humana Press.
4. Electrochemical, Bioelectronic, Piezoelectric, Cellular and Molecular Biosensors. (2018). United States: Springer New York.
5. Malhotra, B. D., & Turner, A. (2003). Advances in Biosensors: Perspectives in Biosensors: Elsevier Science. Sadana, A., Sadana, N. (2014). Biomarkers and Biosensors: Detection and

	Binding to Biosensor Surfaces and Biomarkers Applications. Netherlands: Elsevier Science. 6. Lai-Kwan, C., & Chang, H. T. (2012). From Bioimaging to Biosensors: Noble Metal Nanoparticles in Biodetection: Jenny Stanford Publishing. 7. Tiwari, A., & Turner, A. P. F. (2014). Biosensors Nanotechnology: Wiley.
e-Recourses	

Course: Implications of Metabolism in Exercise		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :

Course Objective : Understand the fundamentals of principal of bioenergetics

• List and define several techniques to study metabolism at the cellular, tissue, and whole organism level.
• List and discuss the primary sources of reactive oxygen species in muscle cells. Describe the regulation of metabolism by reactive oxygen species and calcium.
• Define the lactate threshold and discuss the potential mechanisms responsible for the rise in blood lactate concentration during exercise. Discuss the various fates of lactate molecules produced in skeletal muscle fibers
• Describe the condition driving the fuel switching during exercises
• Discuss the limiting factors for maximal oxygen uptake and determinants of
• Describe respiratory and circulatory response to exercises and their limiting factors to endurance performance
• Describe the pathway responsible for angiogenesis following exercises and the mechanism of fast to slow muscle fiber switching induced by endurance training
• List several myokines that regulates skeletal muscle metabolism and lipogenesis.
• Discuss the cellular events that occur during a myocardial ischemia perfusion insult
• Discuss the mechanisms responsible for exercise-induced preconditioning of both cardiac and skeletal muscles

Course Outcomes :

- The student would be able to various metabolic aspects in cardiac, muscles and other tissues
- Improved understanding of metabolism in human body.
- The students will be able to recall the important various metabolic pathways and their regulation.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	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	15
Unit-II	Basics of energy metabolism; Electron Transport Chain/Oxidative Phosphorylation: Theory and Measurements; Metabolic regulation by ROS and Ca2+; Metabolic Response to Exercises; Exercise and Lactate metabolism; Fuel selection during exercise Metabolic limitations to endurance performance	15
Unit-III	Metabolic Adaptation to Exercises; Metabolic Adaptation 1: Angiogenesis and Mitochondrial Proliferation/Health; Metabolic Adaptation 2: Skeletal Muscle Secretome.; Exercises Preconditioning in Cardiac and Skeletal; Muscle	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	
Reference books	
	1. Spriet, L. L., Hargreaves, M. (2006). Exercise Metabolism. United Kingdom: Human Kinetics. 2. McConell, G. (2022). Exercise Metabolism. Switzerland: Springer International Publishing AG.. 3. Morton, J., MacLaren, D. (2011). Biochemistry for Sport and Exercise Metabolism. United Kingdom: Wiley. 4. Gleeson, M., Maughan, R. J. (2010). The Biochemical Basis of Sports Performance. United Kingdom: OUP Oxford.
e-Recourses	

Course: Applications of Nutraceuticals and Functional Foods in Health		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :

Course Objective : Understand the fundamentals of nutraceuticals

Course Outcomes :

- The student would be able and applications about nutraceuticals
- Improved understanding of nutraceuticals applications in health and exercise.
- The students will be able to recall the important various nutraceuticals

Course Content:

Unit no	Details of the unit	Hours allotted
Unit-I	Introduction to Nutraceuticals as Science: Historical perspective, classification, scope & future prospects. Applied aspects of the Nutraceutical Science. Sources of Nutraceuticals. Relation of Nutraceutical Science with other Sciences: Medicine, Human physiology, genetics, food technology, chemistry and nutrition. 11 103.2Properties, structure and functions of various Phytonutraceuticals: (15L) Glucosamine, Octacosanol, Lycopene, Carnitine, Melatonin and Ornithine, alphaKetoglutarate. Use of proanthocyanidins, grape products, flaxseed oil as Nutraceuticals	15
Unit-II	Food as remedies: Nutraceuticals bridging the gap between food and drug, Nutraceuticals in treatment for cognitive decline, Nutraceutical remedies for common disorders like Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc. Brief idea about some Nutraceutical rich supplements e.g. Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina	15
Unit-III	Nutritional Factors- Promoters and Inhibitors. Types of inhibitors present in various foods and how they can be inactivated. General idea about role of Probiotics and Prebiotics. Assessment of nutritional status. Recent advances in techniques &feeding of substrates. Assessment of nutritional status	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	1. Wildman, R. E. C., & Bruno, R. S. (2019). Handbook of Nutraceuticals and Functional Foods. United Kingdom: CRC Press. 2. Bagchi, D., Preuss, H. G., & Swaroop, A. (2015). Nutraceuticals and Functional Foods in Human Health and Disease Prevention. United Kingdom: CRC Press. 3. Bagchi, D., Swaroop, A., & Bagchi, M. (2015). Genomics, Proteomics and Metabolomics in Nutraceuticals and Functional Foods. United Kingdom: : Wiley.
e-Recourses	

Course: Statistics for Sports Science		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :

Course Objective : To gain basic knowledge about statistics, Uses of various statistical techniques in sports research.

•Students will acquire holistic knowledge and understanding of basic concepts in statistics and its application in science and technology

•Students will be able to collect, analyse, interpret and present the data and bring out the meaning, correlations and interrelationships

•Students will gain knowledge of properties of parametric, semi-parametric and nonparametric testing procedures.

•Students will learn to design experiments and surveys for efficiency.

•Learning the basic statistical software will help students to easily switch over to any other statistical software in future

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Introduction to Biostatistics, their importance inn sports science. Data Collection : primary and secondary data Representation of data: tabular, diagrammatically and graphical method, Frequency Distribution, Histogram, frequency polygons, ogives. Measures of central tendency: Mean, Median and Mode and selection of appropriate. Measures of dispersion: range, quartile and interquartile deviation, mean deviation, standard deviation, coefficient of variations.	15
Unit-II	Correlation: pearsons' coefficient of correlation, rank correlation Regression, off ratio. Sampling: types, sample size, Probability and non-probability, Reliability and validity test Hypothesis: types and testing of hypothesis, its significance in research.	15
Unit-III	Parametric test of significance Analysis of Variance (ANOVA) Non- Parametric test: Chi-square test, Krushal wailles test, Mann whitney U test, sign test. Introduction and Application of Statistical Software. Computer applications- statistical packages for data analyses- SPSS, e-mail, search engines and Microsoft office	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	
Reference books	
	1. Sharma, A.K. (2005). Textbook of Biostatistics I. India: Discovery Publishing House Pvt. Limited. 2. Forthofer, R. N., Lee, E. S. (2014). Introduction to Biostatistics: A Guide to Design, Analysis, and Discovery. United States: Elsevier Science. 3. Kothari, C. R. (2004). Research Methodology: Methods and Techniques. India: New Age International (P) Limited. 4. Rosner, B. (2015). Fundamentals of Biostatistics. United Kingdom: Cengage Learning. 5. Willard, C. A. (2020). Statistical Methods: An Introduction to Basic Statistical Concepts and Analysis. United Kingdom: Taylor & Francis. 6. Albert, J., & Koning, R. H. (2007). Statistical Thinking in Sports. United Kingdom: Taylor & Francis.
e-Recourses	

Course: Nutrition counselling and education		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :
Course Objective : To gain knowledge about Various nutritional aspect associated with sports , Role of nutrition in athletic performances
Course Outcomes :
Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	**Food habits and neurophysiology** Food choices, food Purchase and eating behaviour: Psychological basis; Social interaction; Ethnic, religious and economic influences. Food psychology for health maintenance and fitness: **Neurophysiology**: Special senses, Sensory processing, sleep & wakefulness Neural basis of cognition - Learning, Memory, emotion, Neuronal control of eating & drinking behaviour, Biological clock, nutrition & sports performances Eating disorder in athletes	15
Unit-II	**Medical and Nutritional Issues for the Travelling Athlete**: Nutritional problems often faced by the travelling athletes; Monitoring and Documentation of climate, time zones, altitude, food safety and availability by the support staff or nutritionist; Market surveys and research support for the journey (travel, accommodation, catering, training and event schedules); Noting vaccination and existing allergies; Hydration and supplements for travel within country and overseas; Tips for preventing jet lag and adaptation to different time zone;	15
Unit-III	**Nutrition counselling**: Definition; Requirement; Procedures to adopt; Role of a Sports Dietitian 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 persons:** Definition; Tools useful for education; Strategies for effective nutrition education.	15
	Total hours	45

Examination	
Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	
Reference books	
e-Recourses	

Course: Biochemical Aspects of Health in Sports		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :
Course Objective : To gain knowledge about Various health condition associated with athletes. To gain proper idea about infection prevention and maintain a healthy lifestyle in athlete's athletic carrer.
On completion of this unit students will be able to: • demonstrate their understanding of basic chemistry, biochemistry and effective laboratory practices; • Conduct experiments to examine the factors influencing biochemical and genetic principles relating to exercise; • Describe chemical behaviour of elements and compounds as it relates to exercise, sport and health.
Course Content:

Unit no	**Details of the unit**	**Hours allotted**

Unit-I	Concept of Health and Disease, Lifestyle and Disease, Connection between Physical Activity and Health, Exercise and Its Benefits and hazards	15
Unit-II	Biochemical Basis of Health Hazards and Benefits of Physical Activity, Health Problems in Athletics; Tracking Health, Performance, and Recovery in Athletes, Role of Biomarkers in Sports and Exercise,	15
Unit-III	Biochemical Basis of General Medical Issues For Athletes- Respiratory System, Cardiovascular System, Gastrointestinal system, neuromuscular System, Overtraining Syndrome, Unusual Fatigue.	15
	Total hours	45

Examination	
Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	
Reference books	
	1. Leech, A., Newsholme, E. (2010). Functional Biochemistry in Health and Disease. United Kingdom: Wiley. 2. Elaine C. S. Fragala A. M. Luke Douglas J. Casa (2017) Biomarkers in Sports and Exercise: Tracking Health, Performance And Recovery in Athletes. The Journal of Strength and Conditioning Research. 3. Cuppett, M., Flanagan, K. W. (2017). Medical Conditions in the Athlete. United States: Human Kinetics. 4. Health and Elite Sport: Is High Performance Sport a Healthy Pursuit?. (2014). United Kingdom: Taylor & Francis.
e-Recourses	

Course: Introduction to Sports and Sports Science

Teaching Scheme	Examination Scheme	Credits Allotted
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite:

Course Objective: To gain knowledge and identify the sports science and its various branches

Course Outcomes: The students will be able to understand the various branches of sports science and to apply these in high performance sports.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Introduction to Sports: Games and sports and their importance in the society, Popular sports in the country, List of Olympic sports, Amateur and professional sports, Spots Federations in India, Terminologies used in specific popular Sports, History of development in sports and games in India.	15
Unit-II	Introduction to Sports Science: Scope, definition, interdisciplinary approach and subjects covered under this specialized field. Importance and contribution to performance enhancement, recent developments in sports science. Sports Medicine and sports science concepts.	15
Unit-III	Overview of the specialized fields Exercise physiology, Sports biomechanics, sports psychology and sports management -scope, application area, importance in performance improvement. Adapted sports and adapted physical activity;	15
	Total hours	45

Examination	
Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks

Text books	
	1. M.L. Kamlesh (2007) Field Manual of Sports and Games. Nageen Prakshan Pvt Ltd 2. R.G. Goel (2003) Encyclopaedia of Sports and Games. Vikas Pub. House.
Reference books	
e-Recourses	

Course: Communication skills and scientific writing of Sports Science		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :

Course Objective : To gain a basic idea about scientific communication, writing and research methodology, Uses of different types of research in academic purpose, uses of various research tools

- To develop understanding of the importance of communication in research.
- To identify various sources of information for literature review and data collection.
- To develop an understanding of the ethical dimensions of conducting applied research.

Appreciate the components of scholarly writing and evaluate its quality.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Communication: Introduction: definition, types & barriers; Bases of communication; Models of communicative efficiency; Communication theories & content writing; Importance of sports communication: Definition, theoretical framework, elements; Theories and research; Sociological and legal aspects. Content writing and use of various aids: Electronic and visual communication (Sports magazine, sports books, web, online sports communication, marketing communication in sports).	15
Unit-II	Content writing and use of various aids: Electronic and visual communication (Sports magazine, sports books, web, online sports communication, marketing communication in sports). Scientific writing: – different forms, Research articles, research notes and reports, review article & meta-analysis, dissertation, editorial, letter to editor.	15
Unit-III	Parts of dissertation/ research report / articles Referencing: types of referencing, importance of referencing in paper Plagiarism: types, importance and tools for plagiarism. Journals and journal selection. Impact factor, research index. Software and computer applications in research.	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	
Reference books	
	1. Kothari, C. R. (2004). Research Methodology: Methods and Techniques. India: New Age International (P) Limited. 2. ICMR. (2006). Ethical Guidelines for Biomedical Research on Human Subjects. New Delhi. 3. Nelson, J. K., Thomas, J. R., Silverman, S. J. (2015). Research Methods in Physical Activity. United Kingdom: Human Kinetics. 4. Smith, M. (2017). Research Methods in Sport. United Kingdom: SAGE Publications. 5. O'Donoghue, P. (2009). Research Methods for Sports Performance Analysis. United Kingdom: Taylor & Francis. 6. Armour, K., & MacDonald, D. (Eds.). (2012). Research methods in physical education and youth sport. Routledge. 7. Ridley, D. (2012). The Literature Review: A Step-by-Step Guide for Students. United Kingdom: SAGE Publications.
e-Recourses	

Course: Adaptations to Exercise and Training		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :

Course Objective: To gain knowledge about various adaptations in different sports activities. Gaining a vast knowledge about various physiological responses.

Course Outcomes :

• Learners who complete Science of Exercise will have an improved physiological understanding of how your body responds to exercise, and will be able to identify behaviors, choices, and environments that impact your health and training.

• You will explore a number of significant adjustments required by your body in order to properly respond to the physical stress of exercise, including changes in carbohydrate, fat and protein metabolism, nutritional considerations, causes of muscle soreness & fatigue, and the effectiveness and dangers of performance enhancing drugs.

• Active learning assessments will challenge you to apply this new knowledge via nutrition logs, heart rate monitoring, calculations of your total daily caloric expenditure and body mass index (BMI).

• Finally, learners will examine the scientific evidence for the health benefits of exercise including the prevention and treatment of heart disease, diabetes, cancer, obesity (weight loss), depression, and dementia.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Cardiovascular Adaptations to Endurance, Speed, Strength Training and different environmental conditions, Adaptation to SCUBA, Hypertrophy and Cardiomyopathy in Young and Older Athletes, Heart rate training zone, Sudden Cardiac Death and Exercise in Healthy Adults, cardiovascular systems responses and adaptation to short and long term exercise.	15
Unit-II	Respiratory System Adaptations to Endurance, Speed, Strength Training and different environmental conditions, Ventilatory response to exercise and its use in sports, Ventilatory threshold, , Exercise-Induced Bronchoconstriction; respiratory systems responses and adaptation to short and long term exercise.	15
Unit-III	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 Mechanisms in Strength Training	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	
Reference books	1. Shephard R. J., Miller H.S., Jr. (1992). Exercise and the Heart in Health and Disease. Switzerland: M. Dekker 2. Shephard, R.J., Astrand. (1992). Endurance in sport. Blackwell Science Ltd, USA. 3. McArdle, W. D., Katch, V. L., Katch, F. I. (2011). Essentials of Exercise Physiology. United Kingdom: Wolters Kluwer/Lippincott Williams & Wilkins Health. 4. Froelicher, V. F., Myers, J. (2000). Exercise and the Heart. United Kingdom: W.B. Saunders Company. 5. Storer, T. W., Cooper, C. B. (2001). Exercise Testing and Interpretation: A Practical Approach. United Kingdom: Cambridge University Press. 6. Sue, D. Y., Sietsema, K. E., Ward, S. A., Stringer, W. W. (2020). Wasserman & Whipp's Principles of Exercise Testing and Interpretation: Including Pathophysiology and Clinical Applications. United Kingdom: Lippincott Williams & Wilkins. 7. Bell, C. (2008). Cardiovascular Physiology in Exercise and Sport. United Kingdom: Elsevier Health Sciences. 8. Levitzky, M. G. (2007). Pulmonary Physiology. Spain: Mcgraw-hill. 9. Fernhall, B., Smith, D. L. (2011). Advanced Cardiovascular Exercise Physiology. United Kingdom: Human Kinetics.
e-Recourses	

Course: Drugs and Doping in sports		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :

Course Objective : To gain knowledge about Various drugs and doping methods involved in elite level of sports competition

On successful completion of this program, students should be able to:
•Define key terminology and the regulatory structure of anti-doping in sport
•Relate to the circumstances under which prescription and non-prescription performance-enhancing drugs may be taken by those who participate in sport and exercise and understandthe key historical events that have shaped the current state of doping and anti-doping in sport
•Understand the disciplinary, legal, health and social consequences for athletes who dope
•Summarise the roles and responsibilities of national and international organisations responsible for anti-doping programs
•Understand the World Anti-Doping Code and be able to explain the inclusion criteria, and the categories and classification of substances and methods that appear on the WADA Prohibited List
•Understand the procedures for the doping control process
•Understand the process for the application, review and appeal process of Therapeutic Use Exemptions (TUE), and the responsibility of the healthcare provider throughout this process
•Understand why the Athlete Biological Passport (ABP) is used
•Understand the role of the WADA-accredited laboratories in both testing and research activities
•Describe results management process for an athlete after an Adverse Analytical Finding
•Describe the roles and responsibilities of healthcare providers and Athlete Support Personnel relating to medication use in sport, and safe medication management strategies applicable to the sporting context
•Understand the unique needs of para-sport athletes in relation to anti-doping and medical care
•Develop an understanding of the most common classes of medications and supplements used for evidence-based medical treatment of athletes
•Advise on the prevention of inadvertent doping.
•Understand the essential medication management systems for medical and pharmacy services at major sporting events to be able to undertake a role as a healthcare provider at major sporting event
•Understand how current research strategies are constantly evolving to keep ahead of new doping techniques

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	The Evolution of Doping and Antidoping 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 and NADA Rules	15
Unit-II	Introduction to Pharmaco-kinetics and dynamics. Different types and Methods 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.	15
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.	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	
Reference books	
	1. Hackney, A. C. (2017). Doping, performance-enhancing drugs, and hormones in sport: mechanisms of action and methods of detection. Elsevier. 2. Mottram, D., & Mottram, D. R. (2010). Drugs in sport. Routledge. 3. Jason, P. (2008) Doping: athletes and drugs, Rosenn Publishing, New York
e-Recourses	

Course: Medical Biochemistry

Teaching Scheme	Examination Scheme	Credits Allotted
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
	Total	**03**

Course Pre-requisite :

Course Objective : To gain knowledge about medical biochemistry in sports, Different diseases associated with athlete, different analytical techniques for disease diagnosis in sports person

•Explain the use of selected blood, urine and salivary biochemical markers as indicators of exercise induced changes in human metabolism.
•Evaluate and interpret results from biochemical, haematological and immunological measures of exercise induced changes in human metabolism.
•Synthesise and evaluate critically the research basis for the suitability of the chosen markers in particular exercise/physical activity contexts.
•Demonstrate an ability to work both independently through the formative Question Mark Perception exercises.

Course Content:

Unit no	Details of the unit	Hours allotted
Unit-I	Role of biochemistry in diagnosis of diseases. Gastrointestinal tract - Pancreatic disorders - malabsorption syndromes Hepatobiliary system - metabolism of bilirubin - cirrhosis, hepatitis, gall stones, and tumours. Excretory system - Renal function tests - renal hypertension- urinalysis for normal and abnormal constituents	15
Unit-II	Disorders of carbohydrates metabolism in sports - Glucose level in normal blood, renal threshold, Hyper and hypoglycemia and glycosuria - intravenous and other types of glucose tolerance tests - Glycogen storage disorders. Disorders of nitrogen metabolism - Assimilation and excretion of nitrogen with reference to ammonia, urea, uric acid, creatine, creatinine. Disorders of lipid metabolism - Plasma lipoproteins, cholesterol triglycerides and phospholipids in health and diseases, ketosis, fatty liver.	15
Unit-III	Blood and coagulation - disturbances of blood clotting mechanisms - systematic analysis of hemorrhagic disorders - coagulation and prothrombin time, determination - hemoglobin-anemia - abnormal hemoglobins and their identification. Inherited disorders of metabolism: Changes occurring in Sports persons.	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	
Reference books	
	1. Harper's Review of Biochemistry. (1985). United States: Lange Medical Publications. 2. Rosenberg, L. E., Bondy, P. K. (1980). Metabolic Control and Disease. United Kingdom: Saunders. 3. Conway, T. W., Montgomery, R., Chappell, D., Spector, A. A. (1996). Biochemistry: A Case-oriented Approach. United Kingdom: Mosby. 4. Goldstein, G. W., McGilvery, R. W., Goldstein, G. (1983). Biochemistry, a Functional Approach. Japan: Saunders. 5. Lehninger, A. L., Cox, M. M., Nelson, D. L. (2008). Lehninger principles of biochemistry. United Kingdom: W. H. Freeman. 6. Bangert, S. K., Marshall, W. J. (2008). Clinical Chemistry. United Kingdom: Mosby. 7. Scriver, C. R., Stanbury, J. B. (1989). The Metabolic Basis of Inherited Disease. Colombia: McGraw-Hill.
e-Recourses	

Course: Exercise Nutrition and metabolism		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40	Theory : 3

	End Semester examination : 60	
Practical : Not Applicable		Practical : 0
		Total : 3

Course Pre-requisite :

Course Objective : Understand the fundamentals of Exercise physiology and metabolism

Course Outcomes :

- The student would be able and applications about Exercise Nutrition and metabolism
- Improved understanding of Exercise Nutrition and metabolism in health and exercise.
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Course Content:

Unit no	Details of the unit	Hours allotted
Unit-I	Introduction To Sports Nutrition: Definition; History; Role of international agencies in sports nutrition. Carbohydrate Intake and performance: Type; structure and function of Carbohydrate and its utilisation in the body; Intensity of training impacting carbohydrate utilisation; Type, timing, and quantity of carbohydrate intake in Resistance training and Endurance training; Food sources from different types of carbohydrate; Recommendations of carbohydrate for varying intensities, level of training and for fitness & recreational sports. Fat Intake and performance: Structure and function of fat and its utilisation in the body; Intensity of training impacting fat utilisation; Type, timing and Quantity of fat intake in Resistance training and Endurance training; Amount of fat recommended for varying level of training, fitness or recreationalsports.	15
Unit-II	Protein Intake and performance: Type and Quality of protein and its utilisation in the body; Quantitative measures of protein quality; Protein turnover during endurance versus resistance training; Specific role of amino acids for performance; Type of proteins available in food; Dietary protein strategies for performance enhancement; Requirements set for protein intake for athletes at varying levels of expertise, for fitness and recreational sports. Macronutrients and Energy balance Energy balance concept for athletic performance: Contribution of macronutrients to Energy; Caloricity of nutrients and its impact on optimal performance; Factors affecting energy expenditure (age, gender, ethnicity, level of training, training intensity, type of sport and phase of training); Importance of understanding carbohydrate, protein and fat balance among athletes; Consequences of Energy imbalance in performance. Determining energy requirements of athletes: Contribution of Resting metabolic Rate, Thermic effect of food and Exercise and Non-exercise activity thermogenesis (NEAT) towards energy expenditure; Variation in Resting metabolic rate across resistance versus endurance training; Principles and methods for determining energy expenditure commonly used among athletes; Differences in energy expenditure across events and level of training expertise; Energy availability in assessing energy requirement for athletes; Energy and nutritional requirements for athletes; Variation across age and gender; Energy expenditure pattern during growth; Identifying gaps in research for requirements among Indian athletes.	15
Unit-III	Energy intake pattern of athletes: Nutritional intake concerns for athletes in sport and exercise; Food fads and beliefs among athletes regarding nutrition intake; Energy intake pattern of athletes across various levels of training expertise; Energy intake of athletes during training and for competition. Vitamins and Minerals in exercise performance Vitamins: Types; mode of action; primary functions; excess vs. deficiency;Role of increased intake of vitamins in exercise performance; Role of vitamins in indirectly affecting performance through mental ability, immunity and recuperation to an injury; Research findings relating to performance benefits of key vitamins; Requirements for athletes. Minerals: Types; mode of action; Primary functions; Excess vs. Deficiency; Role of increased intake of minerals in exercise performance; Role of minerals in indirectly affecting performance through mental ability, immunity and recuperation to an injury; Research findings relating to performance benefits of key	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks

1. Text books

1. Hall, J. E., & Guyton, A. C. (2015). Textbook of medical physiology.
2. Pocock, G., Richards, C. D., & Richards, D. A. (2013). Human physiology. Oxford university press.
3. Sherwood, L. (2015). Human physiology: from cells to systems. Cengage learning.
4. Sherwood, L. (2011). Fundamentals of human physiology. Cengage Learning.
5. Wright, D. B. (2000). Human physiology and health. Heinemann.
6. Maughan, R. J., & Shirreffs, S. M. (2013). Food, Nutrition and Sports Performance III: Taylor & Francis.
7. Campbell, B. (Ed.). (2013). Sports nutrition: enhancing athletic performance. CRC

Press.
8. Dunford, M., Doyle, J. A. (2019). Nutrition for Sport and Exercise. United States: Cengage Learning.
9. Jeukendrup, A. (2010). Sports Nutrition-From lab to Kitchen. Meyer & Meyer Sport.
10. Spano, M., Kruskall, L., & Thomas, D. T. (2017). Nutrition for Sport, Exercise, and Health. Human Kinetics.
11. Lanham-New, S. A., Stear, S., Shirreffs, S., & Collins, A. (Eds.). (2011). Sport and exercise nutrition (Vol. 8). John Wiley & Sons.
12. Lamprecht, M. (Ed.). (2014). Antioxidants in sport nutrition. CRC Pre

Course: Therapeutic nutrition		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
		Total : 3

Course Pre-requisite :

Course Objective : Understand the fundamentals of Exercise physiology and metabolism

Course Outcomes :
- The student would be able and applications about Exercise Nutrition and metabolism
- Improved understanding of Exercise Nutrition and metabolism in health and exercise.
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Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	**1. Therapeutic modification of the normal diet.:** Normal, soft and liquid diets and enteral feeding. 2. **Etiology, clinical and bio-chemical manifestation and dietary counselling for the following diseases**: Review of Gastro intestinal diseases. a. Peptic ulcer - gastric and duodenal ulcers. b. Diarrhoeas - acute and chronic. c. Constipation - atonic and spastic. **2.** Mal absorption syndromes – Carbohydrates, Lactose intolerance and fat intolerance sprue, celiac diseases.	15
Unit-II	**Liver Diseases:** Infective Hepatitis, Cirrhosis. Gall bladder diseases. **Diabetes: Juvenile and adult, onset, types:** Type-I and Type-II diabetes mellitus, Gestational diabetes mellitus, Types of insulin and their action, Oral hypoglycemic drugs. **Cardiovascular disorders**: Hypertension, Atherosclerosis, coronary heart disease, Febrile conditions, acute and chronic. Joint pain and stiffness, gout, fractures	15
Unit-III	**Renal Disorders:** Glomerulonephritis, Nephrotic syndrome, acute and chronic renal failure **Nutrition and cancer**. Nutrition in various stages of cancer, chemotherapy, role of antioxidants in cancer. **Nutrition in surgery** Bariatric surgery, ICU patients	15
	Total hours	45

Examination

Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	1. McLaren, D. S. (1963). Malnutrition and the Eye. Nauru: Academic Press. 2. Winter, W. E., Signorino, M. R. (2002). Diabetes Mellitus: Pathophysiology, Etiologies,

Complications, Management, and Laboratory Evaluation: Special Topics in Diagnostic Testing. United States: AACC Press.
3. Mitchell, H. (2012). Comparative Nutrition of Man and Domestic Animals. United States: Elsevier Science.
4. Bogert, L. J. (1941). Nutrition and Physical Fitness. United Kingdom: Saunders.
5. Human Nutrition. (2017). United Kingdom: Oxford University Press.
6. Rajalakshmi, R., Sakhariah, K. K. (2013). Applied Nutrition. India: CBS Publishers & Distributors.
7. Turner, D. (1963). Handbook of Diet Therapy. United States: University of Chicago Press.
8. Passmore, R., Eastwood, M. A., Davidson, S. (1986). Davidson and Passmore Human Nutrition and Dietetics. United Kingdom: Churchill Livingstone.
9. Antia, F. P., Abraham, P. (1997). Clinical Dietetics and Nutrition. India: Oxford University Press.
10. Campbell-Platt, G. (2011). Food Science and Technology: Wiley
11. Ross, A. C., Tucker, K. L., Cousins, R. J., Caballero, B. (2020). Modern Nutrition in Health and Disease. United States: Jones & Bartlett Learning.
12. Krause, M. V. (2004). Krause's Food, Nutrition, & Diet Therapy. India: Saunders.

Course: Women health and exercise		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
		Total : 3

Course Pre-requisite :

Course Objective : Understand the fundamentals of Exercise physiology and metabolism

Course Outcomes :

- The student would be able and applications about Exercise Nutrition and metabolism
- Improved understanding of Exercise Nutrition and metabolism in health and exercise.
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Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	1. Gender difference in muscle morphology 2. Diagnosis and Treatment of Urinary Incontinence and Prolapse 3. Anemia 4. Hypertension in Women	15
Unit-II	1. Bone health: assessment and treatment of osteopenia and osteoporosis 2. Evaluation and Treatment of Common Musculoskeletal Complaints	15
Unit-III	1. Exercise for the childbearing year 2. Exercise for adolescence 3. Exercise for the older woman	15
	Total hours	45

Examination	
Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	1. Swedan, N. (Ed.). (2001). Women's sports medicine and rehabilitation. Lippincott Williams & Wilkins, An Aspen Publication. 2. Ireland, M. L., & Nattiv, A. (2002). The Female Athlete: W.B. Saunders. 3. Cardozo, L. and Staskin, D. (2006): Textbook of Female Urology and Urogynaecology (2nd edn). London: Isis Medical Media Ltd. 4. Mantle, J., Haslam, J., Barton, S., & Cardozo, L. (2004). Physiotherapy in Obstetrics and Gynaecology: Butterworth-Heinemann. 5. Sapsford, R., Bullock-Saxton, J., & Markwell, S. (Eds.). (1998). Women's health: a textbook for physiotherapists. London: WB Saunders. 6. Bo, K., Berghmans, B., Morkved, S., & Van Kampen, M. (2014). Evidence-based physical therapy for the pelvic floor: bridging science and clinical practice. Elsevier health sciences. London: Churchill Livingstone.

Course: Nutrition for resistance and power sports		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
		Total : 3
Course Pre-requisite :		
Course Objective : Understand the fundamentals of Exercise physiology and metabolism		
Course Outcomes : • The student would be able and applications about Exercise Nutrition and metabolism • Improved understanding of Exercise Nutrition and metabolism in health and exercise. •		
Course Content:		

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	**Nutrition for strength sport athletes** a. Types and characteristics of strength or high intensity sports (sprinting, throwing, body building etc) b. Physiology of energy systems, c. Nutritional requirements- macronutrients- carbohydrates, fats proteins d. Muscle building- post exercise anabolic window e. Impact of resistance training on body composition of athletes in strength sports f. Micronutrient requirement g. Nutrient periodization in training and competition	15
Unit-II	**Nutrition for weight class sports- combat sports, individual events** a. Types and characteristics- physiological needs, body composition and energy systems used. b. Macro and micronutrient requirements in training and competition. c. Hydration guidelines in weight class sports d. Making weight- weight loss and gain in training and competition- e. Strategies to promote healthy weight loss in athletes	15

Unit-III	**Nutrition for racket sport athletes- badminton, squash, tennis** a. Characteristics- physiology, energy system, and body composition, duration of match, training. b. Macro and micronutrient requirements in training and competition c. Dietary and hydration strategies for athletes in different periods of training and competition **Use of Nutritional supplements in strength/power sports- use, effects, efficacy and safety**	15
	Total hours	45

Examination	
Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	1. Manore, M., Meyer, N. L., & Thompson, J. (2009). Sport nutrition for health and performance. Human Kinetics. 2. Ranchordas, M. K., Rogerson, D., Ruddock, A., Killer, S. C., & Winter, E. M. (2013). Nutrition for tennis: practical recommendations. J Sports Sci Med, 12(2), 211-24. 3. Jeukendrup, A., & Gleeson, M. (2010). Sport nutrition: an introduction to energy production and performance (No. Ed. 2). Human Kinetics. 4. Seebohar, B. (2011). Nutrition periodization for athletes: Taking traditional sports nutrition to the next level. Bull Publishing Company. 5. 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. 6. Helms, E. R., Aragon, A. A., & Fitschen, P. J. (2014). Evidence-based recommendations for natural bodybuilding contest preparation: nutrition and supplementation. Journal of the International Society of Sports Nutrition, 11(1), 20. 7. McArdle, W. D., Katch, F. I., & Katch, V. L. (2009). Sports and exercise nutrition. Lippincott Williams & Wilkins.

Course: Diet planning for special groups		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
		Total : 3
Course Pre-requisite :		
Course Objective : Understand the fundamentals of Exercise physiology and metabolism		
Course Outcomes : • The student would be able and applications about Exercise Nutrition and metabolism		

• Improved understanding of Exercise Nutrition and metabolism in health and exercise. •		
Course Content:		
Unit no	**Details of the unit**	**Hours allotted**
Unit-I	**Nutritional concerns of travelling and vegan athletes** **2. Athletes performing under altered climatic conditions** a. High altitude b. Mountaineers c. High and low climatic temperature etc. **3. Nutrition guidelines for athletes with physical disabilities**	15
Unit-II	**Management of selected nutritional problems among sportsperson** **a. Anaemia -** causes, consequences and role of nutrition in the prevention and management **b. Osteoporosis -** Bone Physiology, Effect of Nutrition, age, sex and exercise on bone health, Preventive and curative strategies of osteoporosis **Nutritional management of Exercise Injuries**	15
Unit-III	**Nutrition for Weight Management in Sports and Non-Sports Persons of Various Age Groups / Categories.** a. Eating Disorders among sports persons, Types of Sports with weight restrictions b. Need for Weight Loss & weight gain, Negative aspects of weight loss and recovery strategies c. Dietary & Lifestyle Approaches for weight and fat loss and/gain **Nutritional Management of clinical conditions among sports** a. Diabetes mellitus b. Hypertension, atherosclerosis c. Gastro intestinal diseases-Peptic Ulcer, GI disturbance due to anxiety, Celiac disease, IBS	15
	Total hours	45

Examination	
Internal Assessment:	
Part-A	
	CIA –I : Unit-I & Unit-II - 20 marks
	CIA –II : Unit-III & Unit-IV - 20 marks
Part-B	
	Assignments
Part-C	
	End Semester examination -60 marks
Text books	1. Denardot, D. (1999). Nutrition for serious athletes. Human Kinetics Publishers. 2. Cerestar-Cargill., Brouns, F. (2003). Essentials of Sports Nutrition. Germany: Wiley. 3. Burke, L. Y.and Deking, V. (2006) Clinical Sports Nutrition (3rd ed.), Tata McGraw Hill Pub. England. 4. Summerfield, L. M. (2016). Nutrition, Exercise, and Behavior: An Integrated Approach to Weight Management. United States: Cengage Learning. 5. Wolinksy, I. (1998) Nutrition in Exercise and Sports CRC press NY. 6. Wolinsky, Ira and Driskell, J. (2004) Nutritional Ergogenic aids, CRC Press NY.

Course: Food hygiene and management		
Teaching Scheme	**Examination Scheme**	**Credits Allotted**
Theory : 3 hours /Week	Internal Assessment : 40 End Semester examination : 60	Theory : 3
Practical : Not Applicable		Practical : 0
		Total : 3
Course Pre-requisite :		
Course Objective : Understand the fundamentals of Exercise physiology and metabolism		
Course Outcomes : • The student would be able and applications about Exercise Nutrition and metabolism		

• Improved understanding of Exercise Nutrition and metabolism in health and exercise. •		
Course Content:		
Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Characteristics of food Types of food; What is quality? Quantitative aspects of quality Sensory quality Nutritional quality Foods recommended for use in lunchrooms and kiosks Food Purchasing : Food Buyer Purchasing activity Buying food Receiving and Storage of Food Menu Planning Why plan menus? Planning menus Writing menus Types of menus Construction of menus Menu display	15
Unit-II	Food production : system and process Effect of preparation and cooking methods on the nutritional quality of foods Some large quantity cooking techniques Effective use of leftovers Holding techniques	15
Unit-III	Hygiene and Sanitation Environmental hygiene and sanitation Hygiene in food handling Personnel hygiene Food Adulteration: Types of adulterants Intentional adulterants Incidental adulterants Food laws Food standardization and regulation agencies in India International standards	15
	Total hours	45
Examination		
Internal Assessment:		
Part-A		
	CIA –I : Unit-I & Unit-II - 20 marks	
	CIA –II : Unit-III & Unit-IV - 20 marks	
Part-B		
	Assignments	
Part-C		
	End Semester examination -60 marks	
	1. Sethi, M. (1993). Catering Management: An Integrated Approach. India: Wiley Eastern. 2. Srilakshmi, B. (2006). Nutrition Science. India: New Age International.	