School of Sports Sciences
Department of Sports Bio-Sciences

Proposed Syllabus for

M.Sc. in Sports Physiology

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

School of Sports Science
Department of Sports Bioscience
Draft curriculum template and content for
M.Sc. Sports Physiology

SEMESTER-I

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

SEMESTER-II

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

SEMESTER-III

Code	Title of course	Type of course	Credits
MSSP 501	Physiological Adaptations to Exercise and Training	C8	4
MSSP 502	Physiological Testing and Sports Performance Evaluation	C9	4
MSSP 503	Research methodology, Entrepreneurship & Ethics	C10	2
MSSP 504	Internship	AECC2	4
MSSP 53x	Discipline elective IV	DE4	3
MSSP 53x	Open elective I	NDSE1	3
MSSP 505	Practicum IV	P4	2
MSSP 506	Practicum V	P5	2
			24

SEMESTER-IV

Code	Title of course	Type of course	Credits
MSSP 53x	Discipline elective V	DE5	3
MSSP 53x	Discipline elective VI	DE6	3
MSSP 53x	Open elective II	NDSE2	3
MSSP 507	Major Dissertation	AECC3	15
			24

Discipline electives offered by the department

1. Fatigue, Injuries and Rehabilitation
2. Sports Specific Nutrition
3. Dietary Supplements and Ergogenic Aids
4. Exercise and Environmental Physiology
5. Statistics for Sports Science
6. Drugs and doping in sports
7. Sports Ergonomics
8. Genetics in Sports Performance
9. Essentials of Sports
10. Health Fitness and Wellness
11. Communication skills and Scientific Writing of Sports Science
12. Introduction to Sports and Sports Science
13. Nutrition counselling and education
14. Biosensors for Sports
15. Motor learning and Muscle physiology in sports
16. Sports Medicine and Physiotherapy
17. 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:

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. 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

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.

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 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.

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

Semester – III

Course Title: **Physiological Adaptations to Exercise and 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 Pre-requisite: Students should have basic knowledge of biomolecules, metabolism and physiology.

Course Objectives:

- To impart the knowledge of cardiorespiratory and neuromuscular adaptations to various aspects of sports training.
- To impart the knowledge regarding environmental change adaptations in different aspects of sports training.
- To familiarize students about associated risks during adaptations.
- To understand cardiorespiratory and neuromuscular adaptations to various aspects of sports training.
- Improved awareness about the risks associated with adaptations

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 and Strength Training, Hypertrophy and Cardiomyopathy in Young and Older Athletes, Heart rate training zone, Effects Of High Altitude, Sudden Cardiac Death and Exercise in Healthy Adults	15
Unit-II	Respiratory System Adaptations to Endurance and Strength Training, Ventilatory response to exercise and its use in sports, Ventilatory threshold, , Exercise-Induced Bronchoconstriction, Control of Breathing during exercise; The Respiratory System under Stress, respiratory systems adaptation to long-term exercise, Adaptations to systematic Training, Effects Of High Altitude.	15
Unit-III	Muscular Mechanisms in Aerobic Endurance Training; Muscle Molecular, Mechanisms in Strength Training, Muscle Property Changes in Strength Training	15
Unit-IV	Initial responses of the neuromuscular systems to exercise, Training Adaptation of the Neuromuscular System. Neuromuscular adaptations to Endurance training, Neural Mechanisms in Aerobic Endurance Training, Neural molecular changes in endurance training, Neural Mechanisms in Strength Training	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. 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. Levitzky, M. G. (2007). Pulmonary Physiology. Spain: Mcgraw-hill.
8. Fernhall, B., Smith, D. L. (2011). Advanced Cardiovascular Exercise Physiology. United Kingdom: Human Kinetics.

e-Recourses	

Course Title: Physiological Testing and Sports Performance Evaluation		
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 gain knowledge about basics of Performance evaluation and testing.
- To learn the changes in human body systems due to exercise and sporting activities in an integrated manner.
- To understand about various aspects of test construction.
- To study about various test protocols and modes of performance testing

Course Outcomes:

- Students will be ready to study effect of exercise in detail and in application perspective.
- Students will be able to measure the changes and interpret them in the context of sports
- Improved understanding of performance evaluation and testing.
- Students will be able to design various test protocols.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Introduction to Test, Measurement, Evaluation and Research, Basic concepts in Tests: Evaluation, Validity, Reliability, Objectivity and Norms, Test construction and its Organisation and Administration; Pre-test considerations: Risks associated and Safety considerations, ACSM guidelines for when to stop a Test, Pre-exercise test evaluations	15
Unit-II	Test Order: Equations used to estimate aerobic power from TM protocols, Equations used to estimate aerobic power from Cycle ergometer protocols (arm and leg), Calculations used to estimate aerobic power from other variables	15
Unit-III	Modes of testing, Muscular strength, endurance and flexibility, Body composition and Anthropometry, Balance, Agility, Coordination, Reaction time and Anaerobic power, Physical Fitness Batteries, Specific Sports Skill Tests (Soccer, Basketball, Volleyball, Hockey, Badminton, Tennis and other sports)	15
Unit-IV	Calculation of HR MAX and 85% HR max depending on protocol, Population considerations: Children, Elderly and Apparently healthy. Test protocols used for measuring the health and skill-related components of fitness, CV endurance field tests, VO2max testing, Norm tables, Maximal versus submaximal tests	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. Gibson, A. L., Heyward, V. H. (2018). Advanced Fitness Assessment and Exercise Prescription. United States: Human Kinetics, Incorporated.
2. Dumke, C., Haff, G. G. (2021). Laboratory Manual for Exercise Physiology. United States: Human Kinetics.
3. Disch, J. G., Mood, D., Kang, M., Morrow, J. R. (2016). Measurement and Evaluation in Human Performance. United States: Human Kinetics.
4. Gore, C. J., Tanner, R. K. (2012). Physiological Tests for Elite Athletes, 2E. United States: Human Kinetics.
5. ACSM's Guidelines for Exercise Testing and Prescription. (2013). United Kingdom: Wolters Kluwer Health.
6. Kansal, D. K. (2021). A Textbook of Sports Science: TEST, EVALUATION, ACCREDITATION, MEASUREMENTS And STANDARDS (TEAMS). K.K. Publications.
7. Kansal, D. K. (2008). Textbook of Applied Measurement, Evaluation & Sports SelectionIndia: SSS Publications.
8. Gibson, A. L., Heyward, V. H. (2018). Advanced Fitness Assessment and Exercise Prescription. United States: Human Kinetics, Incorporated.
9. American College of Sports Medicine (Ed.). (2013). ACSM's health-related physical fitness assessment manual. Lippincott Williams & Wilkins.

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**
• Blood Pressure Measurements: Effects of Body Position, Dynamic Exercise and Isometric Contractions on BP • Resting Metabolic Rate Determinations: Predicting and Measuring RMR • Determination of VO2max by direct and indirect method. • Assessment of Peak lactate, lactate tolarence, lactate clearance. • Determination of anaerobic threshold. • Assessment of EMG and ECG. • Oxygen Deficit and EPOC Evaluations • Submaximal Exercise Testing: Submaximal Bench Step Test, Submaximal Treadmill Test, Submaximal Cycle Ergometer Test • Pulmonary Function Testing: Lung Volumes and Capacities, Pulmonary Function	30

Practicum - V	
Details of the unit	**Hours allotted**
• MMT for Major Muscle Groups of the body • Use of Body Composition Software • Use of Fitness Related Software • Exercise Prescription and Counselling for Weight Management • Demonstration of ROM Exercises and Prescription • Measurement of heart rate and blood pressure during and after exercise.(each student is expected to practice measurement on 50 volunteers and determine intra experimenter and inter-experimenter variation) • Cardio-pulmonary resuscitation practice on Human Mannequin • Aerobic power measurement using Queens' college test, Astrand-Rhyming test. • Tests for anaerobic power (Wingate Test)	30

Discipline electives offered by the department

Course Title: **Fatigue, Injuries and Rehabilitation**		
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	**04**
Course Pre-requisite:		
Course Objectives: • To gain knowledge about basics of fatigue, overtraining and its effects. • Study about sports injuries and their management. • To study about principles of rehabilitation and various therapeutic modalities. • Improved understanding of various sports injuries and mechanism of rehabilitation		

Course Outcomes:

- Students will be able to analyze and determine various sports injuries.
- Students will be able to analyze and determine various sports injuries.
- Application of various mechanism of rehabilitation

Course Content:

Unit no	Details of the unit	Hours allotted
Unit-I	Concept of Overloading, Overtraining, Fatigue and Staleness, Symptoms and Causes of Fatigue, Types of Fatigue, Theories associated with Fatigue, Definition, Types, Symptoms, Findings, Underlying Mechanisms and Frequency of Overtraining and Overtraining Syndrome. Oxygen Debt Theory, Recovery Oxygen Uptake or Excess Post-exercise Oxygen Consumption (EPOC), Implications of EPOC for Exercise and Recovery, Optimal Recovery from Steady-Rate Exercise and Non–Steady-Rate Exercise, Intermittent Exercise and Recovery	15
Unit-II	Sports Injury- Meaning, Classification, Causes, Types, General guidelines for their Prevention, Recovery Time, Introduction and Management of common Sports Injuries (Fracture, Dislocation, Laceration, Abrasion, Sprain and Strain), How to avoid Sports Injuries, Role of Warm-up and Cool Down	15
Unit-III	Rehabilitation: Meaning, Concepts, Objective and scope of Rehabilitation, Principal of care and Rehabilitation Therapeutic Modalities: Electrotherapeutic modalities (Shortwave Diathermy, Ultrasound, T.E.N.S), Heat and Cold, Soft tissue Massage, Aquatic Rehabilitation Exercise, Therapeutic Exercise, Therapeutic Nutrition, Psychological Rehabilitation	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. Phillips, S. (2016). Fatigue in Sport and Exercise. United Kingdom: Routledge.
2. Denegar, C. R., Saliba, S. F., Saliba, E. (2016). Therapeutic Modalities for Musculoskeletal Injuries. United Kingdom: Human Kinetics.
3. Prentice, W. E. (2006). Essentials of Athletic Injury Management with eSims. United Kingdom: McGraw-Hill Higher Education.
4. Khan, K., Brukner, P. (2002). Clinical Sports Medicine. Austria: McGraw-Hill.
5. Sinha, A. G. (2009). Principles and Practice of Therapeutic Massage. India: Jaypee Brothers Medical Publishers Pvt. Limited.
6. Singh, J. (2017). Textbook of Electrotherapy. India: Jaypee Brothers Medical Publishers Pvt. Limited.
7. Lehmann, M., Foster, C., Gastmann, U. (2007). Overload, Performance Incompetence, and Regeneration in Sport. United States: Springer US.

e-Recourses

Course Title: Sports Specific Nutrition

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:

Course Objectives:

- Improved understanding of sports and training phase specific diets of sportsperson
- Knowledge of use of nutritional supplements
- Improved understanding of various healthy food and fluid choices

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	15
Unit-II	Supplement usage and Dietary periodisation among the athletes; Case studies on team sports. Dietary and Hydration Strategies; nutrient requirements	15
Unit-III	Nutrition for individual, technical and combative 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. n	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.

e-Recourses

Course Title: Dietary Supplements and Ergogenic Aids		
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:

Course Objectives:

- Improved understanding of fatigue and overtraining.
- Students will be able to analyze and determine various sports injuries.
- Improved understanding of various mechanism of rehabilitation

Course Outcomes:

-

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. Botanical Ergogenic Supplements, Metabolite Ergogenic Supplements, Use of Nutritional Supplements in Sport and Exercise: Usage, Dosage and safety. Behavioural Outcomes, Behavioural Effects of Selected Supplements Commonly Employed for Performance, Fitness, and Health.	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. Antonio, J., Stout, J. R. (2002). Supplements for Endurance Athletes. United Kingdom: Human Kinetics.
2. Greenwood, M., Cooke, M. B., Ziegenfuss, T., Kalman, D. S., & Antonio, J. (Eds.). (2015). Nutritional supplements in sports and exercise. Humana Press.
3. Cooper, C. E. (2008). Drugs and ergogenic aids to improve sport performance. Essays in biochemistry, 44, 1-10.

e-Recourses

Course Title: Exercise and Environmental Physiology		
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:

Course Objectives:

- The objective of this course is to examine the responses and adaptations of the human body to exercise under

different environmental conditions.

Course Outcomes:

- Students will be able to describe and discuss the stresses placed on the human body during exercise performed under different environmental conditions and the adaptations made by the body with extended or repeated exposure to those conditions.
- Tutorial and laboratory sessions will enable students to experience and apply course content and learn in a practical setting

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Concept of altitude and atmospheric pressure, different type of performance, maximal O2 conception at altitude, cardiovascular and respiratory changes at altitude, acclimatization at altitude, training at altitude	15
Unit-II	Effect of cold exposure, wind chill factor, insulation factor, heat production and factor affecting cold, coping with hypothermia, concept of air pollution and variable of air pollution	15
Unit-III	Overview of heat balance during exercise, temperature measurement during exercise, overview of heat production and heat loss, heat storage in body during exercise, body's thermostat, thermal events during exercise, Heat index, exercise in a hot environment, sweat rate during exercise, performance changes, exercise related heat injuries, prevention of dehydration during exercise, heat acclimatization, measurement of relative humidity and WBGT index.	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. Riebe, D., Pescatello, L. S., Thompson, P. D. (2013). ACSM's Guidelines for Exercise Testing and Prescription. (2013). United Kingdom: Wolters Kluwer Health.
2. Kenney, W. L., Wilmore, J. H., Costill, D. L. (2015). Physiology of Sport and Exercise. United Kingdom: Human Kinetics.
3. Katch, V. L., Katch, F. I., McArdle, W. D. (2015). Exercise Physiology: Nutrition, Energy, and Human Performance. United Kingdom: Wolters Kluwer Health/Lippincott Williams & Wilkins.

e-Recourses

Course Title: Statistics for Sports Science		
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:

Course Objectives:

- To provide knowledge and understanding of basic statistical concepts.
- To provide understanding and skills of various statistical data analysis tests and presentation of data.

Course Outcomes:

- To enable students to utilise statistical software programmes.
- Improved understanding of various statistical concepts.
- Students will be able to apply various stastitical methods and tests in data analysis

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Students will develop competence to utilise statistical software programmes. Introduction to Biostatistics, Frequency Distribution, Variable and Attribute, Line-diagram, Bar-diagram, Pie chart, Histogram, Mean, Median and Mode	15
Unit-II	Variance, Standard deviation; Standard error of mean, Null hypothesis, Level of significance and Probability; Regression and correlation	15
Unit-III	Student‘s t-test, Fisher's t-test, Chi-square test, Analysis of Variance (ANOVA), ANCOVA, Introduction and Application of Statistical Software.	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. 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 Title: Drugs and doping in 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:

Course Objectives:

- Understand the disciplinary, legal, health and social consequences for athletes who dope
- Understanding the roles and responsibilities of national and international organizations responsible for anti-

doping programs and the categories and classification of substances and methods that appear on the WADA Prohibited List

- Understand the role of Athlete Biological Passport (ABP) and WADA-accredited laboratories in both testing and research activities
- Understand how current research strategies are constantly evolving to keep ahead of new doping techniques..

Course Outcomes:

- Relate to the circumstances under which prescription and non-prescription performance-enhancing drugs may be taken
- Develop an understanding of the most common classes of medications and supplements used for evidence-based medical treatment of athletes
- Describe results management process for an athlete after an Adverse Analytical Finding
- Advise on the prevention of inadvertent doping

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	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. WADA and NADA Rules and Regulations Regarding Inadvertent Use of Prohibited Substances.	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. 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 Title: Sports Ergonomics		
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:

Course Objectives:

- Improved understanding of Physical Properties of Human Structures, Health, and Safety.
- Improved understanding of Ergonomics Models and Training Modes in Sport

Course Outcomes:

- Students will be able to analyze Influence of Sports Equipment and Playing Surfaces.
- Students will be able to analyze risk factors of ergonomics in sports.
- Students will be able to understand performance influencing factors in different sports.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Introduction to Ergonomics; Ergonomical Risk Factors in Sports: Physical Properties of Human Structures, Health and Safety, Ergonomics Models and Training Modes in Sport and Leisure, Competitive and Training Stress in Sport	15
Unit-II	Influence of Sports Equipment and Playing Surfaces, Ergonomics in Physical Activities.	15
Unit-III	Clinical Aspects in Sports Ergonomics, Holistic and Nutritional Ergonomics Perspective, Researching Ergogenic Aids.	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. Hong, Y. (2013). Routledge Handbook of Ergonomics in Sport and Exercise. United Kingdom: Taylor & Francis.
2. Reilly, T. (2010). Ergonomics in Sport and Physical Activity: Enhancing Performance and Improving Safety. United Kingdom: Human Kinetics.
3. Kenney, W. L., Wilmore, J. H., Costill, D. L. (2015). Physiology of Sport and Exercise. United Kingdom: Human Kinetics.
4. Dey. (2012). A Textbook Sports and Exercise Physiology. India: Jaypee Brothers Medical Publishers.

e-Recourses

Course Title: Genetics in Sports Performance		
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:		
Course Objectives:		

- An understanding of the Sport and exercise genetics.
- An understanding of the clinical relevance of genetics concepts.
- Understand some of the types of disease that might be treatable by gene therapy.
- Understand how genetics may be used in the design of drugs.

Course Outcomes:

- A working understanding of the genetic terminology required to be able to function well in the transfusion laboratory.
- Application of the basic principles of sports genetic manipulation
- An appreciation of the importance of genetics as a foundation of transfusion science theory and practice.

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Basic Genetic Concepts, Mendelian inheritance, population genetics, Human chromosome Karyotype, Chromosome Disorders, Genome Structure and Genetic Mapping, Mitochondrial Inheritance, The Genetic Code and Genetic Alterations, DNA Injuries and Repair, Monogenic and Polygenetic Diseases, Molecular Diagnostics, Epigenetics in sports.	15
Unit-II	Ethics of Genetic Testing and Research in Sport, Current Challenges and Directions to the Future, Genetic Modifications in Sports, Ethical Considerations of Genetic Manipulation in Sport, Gene Therapy and Gene Doping.	15
Unit-III	Connecting Sports and Genetics, The Genetics of Sports Injuries and Athletic Performance, Genetic Contributors To Hypertrophic Cardiomyopathy, Chronic Traumatic Encephalopathy, Different Classes of Performance Enhancing Genetic Variants	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. Korf, B. R., Irons, M. B. (2013). Human Genetics and Genomics, Includes Wiley E-Text. United Kingdom: Wiley.
2. Simmons, M. J., Snustad, D. P. (2015). Principles of Genetics. India: Wiley.
3. Lewis, R. (2017). Human Genetics: The Basics. United Kingdom: Routledge.
4. Posthumus, M., Collins, M. Genetics and Sports. (2016). Germany: S. Karger AG.
5. Ostrander, E. A., Huson, H. J., Ostrander, G. K. (2009). Genetics of athletic performance. Annu Rev Genomics Hum Genet. PMID: 19630564.
6. Guth, L. M., & Roth, S. M. (2013). Genetic influence on athletic performance. Current opinion in pediatrics, 25(6), 653.
7. Maffulli, N., Margiotti, K., Longo, U. G., Loppini, M., Fazio, V. M., & Denaro, V. (2013). The genetics of sports injuries and athletic performance. Muscles, ligaments and tendons journal, 3(3), 173.

e-Recourses

Course Title: Essentials of 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:

Course Objectives:

- Improved understanding of basics of Sports Science and Physical Education.
- Understanding various Philosophies in Sports and Physical Education.

Course Outcomes:

- Students will be able to describe various Philosophies and their impact in Sports and Physical Education.
- Students will be able to describe organizational process, rules and regulations of competitions..

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	What are Play, Game and Sports? Types of sports and recreational activities, Importance of free play and organizational games, Terminology: Sports Science and Physical Education, Health Related and Motor performance Related Fitness. Philosophy and its need in Sports and Physical Education, Idealism, Naturalism and Pragmatism in Physical Education, Physical Education in Ancient Greek, Rome, India and Modern India. History of Olympic Games, Asian Games, SAARC Games and SAF Games, National Sports Awards.	15
Unit-II	Introduction to General Rules and Regulations of Selected Sports (Football, Field Hockey, Basketball, Volleyball, Cricket, Badminton, Tennis), Introduction to Playfields and Track Specifications, General Organizational Process of Sports Competitions. Trends and Problems in Sports Sciences and Physical Education in 21st Century..	15
Unit-III	Health and Wellness (physical, mental, psychological, social and spiritual) and Athletics, Sports Careers: Media, Management, Performance, Coaching and other Related Areas.	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. Bucher, C. A. (1975). Foundations of Physical Education. United Kingdom: Mosby.
2. Llewellyn, M. P., Gleaves, J., Kretchmar, R. S., Dyreson, M. (2017). History and Philosophy of Sport and Physical Activity. United States: Human Kinetics.
3. Snyder, R. A., Scott, H. A. (1954). Professional Preparation in Health, Physical Education, and Recreation. United Kingdom: McGraw-Hill.
4. Brown, J. P., Barrow, H. M. (1988). Man and Movement: Principles of Physical Education. United Kingdom: Lea & Febiger.
5. Joseph, P. M. (1956). Organisation of Physical Education. Bombay: Old Student Association, TIPE, 57**.**
6. Kamlesh, M. L., Sangral, M. S. (2011). Principles and History of Physical Education (2nd Revised Edition). India: Friends Publications (India).
7. Bucher, C. A., Wuest, D. A. (1991). Foundations of Physical Education and Sport. United Kingdom: Mosby Year Book.

e-Recourses

Course Title: Health Fitness and Wellness		
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:

Course Objectives:

- The students will be able to understand the concepts of health, fitness, and wellness.
- understanding regarding the importance of exercise and physical activities
- Improved understanding of the healthy lifestyle and stress management.

Course Outcomes:

- The students will be able to understand the concepts of health, fitness, and wellness
- The students will be able to apply the principles of exercise and fitness to improve health and fitness.
- The students will be able to explain the importance of exercise and fitness to improve health and fitness..

Course Content:

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Improved understanding of the healthy lifestyle and stress management. Introduction to Health: Concept of health, Lifestyle and Disease, Ageing.	15
Unit-II	Physical Activities & Fitness: Concept to Fitness, Exercise and its Principles, Health Education Recreation & Dance..	15
Unit-III	Healthy Life Style Approach: Concept of Wellness, Wellbeing, Stress Management	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. Hoeger, C. I., Fawson, A. L., Hoeger, S. A., Hoeger, W. W. (2017). Fitness and Wellness. United States: Cengage Learning.
2. Lindsey, R., Welk, G., Corbin, C. B. (2000). Concepts of Fitness and Wellness: A Comprehensive Lifestyle Approach. United States: McGraw-Hill.
3. Williams, M. H. (1990). Lifetime Fitness and Wellness: A Personal Choice. United States: W.C. Brown.
4. Detels, R., Beaglehole, R., Lansang, M. A., & Gulliford, M. (2011). Oxford textbook of public health. Oxford University Press.
5. Lal, S. (2014). Textbook of Community Medicine: Preventive and Social Medicine. India: CBS Publishers & Distributors.
6. Kirch, W. (Ed.). (2008). Encyclopedia of Public Health: Volume 1: A-H Volume 2: I-Z. Springer Science & Business Media.
7. Schneider, M. J. (2020). Introduction to public health. Jones & Bartlett Learning.

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: 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.	
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.	
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;	
	Total hours	
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. Kamlesh, M.L. (2007) Field Manual of Sports and Games. Nageen Prakshan Pvt Ltd 2. Goel, R.G. (2003) Encyclopaedia of Sports and Games. Vikas Publication House.	
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	
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;	
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.	
	Total hours	
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 Title: Biosensors for 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: 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: Motor learning and Muscle physiology 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 physiological processes involved in human motion to learn neural mechanism of motor learning To lean system of motor control and training related adaptations		
Course Outcomes: The students will understand the integrative nature of neuromuscular control and learning system; also they will be able to support the coaches in evaluation difficulties in skill learning.		
Course Content:		

Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Mechanism of muscle contraction, Types of muscle contractions (e.g., concentric, eccentric, isometric). Motor units and its recruitment; Actions of individual muscles /muscle groups, Joint movements, Proprioception.	
Unit-II	Neuro-muscular control of human motion: System for movement production; Nature of Voluntary Control of single muscle, Control of Motor Actions, Posture control mechanisms, Trajectory Formation in Timed Repetitive Movements, Neurophysiology of Locomotion	
Unit-III	MOTOR LEARNING: Theories of motor learning; Role of the Motor Cortex in Motor Learning; effects of practice and adaptation; Theories of Motor Control; Methods in motor control studies; Physiological Basis of Motor Learning and Recovery of Function, Stages of Learning; Skill learning –open and closed systems	
	Total hours	

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. Latash, M., & Lestienne, F. (2006). Motor Control and Learning: Springer US. 2. Latash, M. L. (2008). Neurophysiological basis of movement. United Kingdom: Human Kinetics.. 3. Vladimir, M. (2001) Measurement of human locomotion. CRC Press LLC, USA. 4. Winter, D. A. (2009). Biomechanics and Motor Control of Human Movement. United Kingdom: Wiley. 5. Kendall and Kendall (1986) Muscle- Function and Testing. Williams and Wilkins, USA.
e-Recourses	

Course: Sports Medicine and Physiotherapy		
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 History of sports and progress of sports science in modern era		
Course Outcomes :		
Course Content:		
Unit no	**Details of the unit**	**Hours allotted**
Unit-I	Sports Medicine: Meaning, Definition, Aims, Objectives, Modern Concepts and Importance. Athletic Care and Rehabilitation: Contribution of Physical Education Teachers and Coaches, Sports Injuries: Meaning, Importance, Prevention of Injuries in Sports.	
Unit-II	Physiotherapy: Definition – Guiding Principles of Physiotherapy, Importance of Physiotherapy, Introduction and Demonstration of Treatments – Electrotherapy – Infrared Radiation Therapy– Ultraviolet Radiation Therapy – Short Wave Diathermy –Ultrasound Therapy.	
Unit-III	Hydrotherapy: Introduction and demonstration of treatments of Cryotherapy, Thermotherapy, Contrast Bath, Whirlpool Bath – Steam Bath – Sauna Bath – Hot Water Fomentation, Posture, First Aid and Sports Injuries Posture :Definition, Types, Postural Deformities: Kyposis, Lordosis and Scoliosis. s. First Aid –General Rules – First Aid Treatment – Shock, Sun Stroke –, Fainting, Bleeding. Common Sports Injuries – Diagnosis – First Aid Treatment,	
	Total hours	

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. Christine, M. D., (1999). Physiology of sports and exercise.USA: Human Kinetics. 2. Conley, M. (2000). Bioenergetics of exercise training. In T.R. Baechle, & R.W. Earle, (Eds.), 3. Baechle, T. R., & Earle, R. W. (Eds.). (2008). Essentials of strength training and conditioning. Human kinetics. 4. David, R. M. (2005). Drugs in sports, (4th Ed). Routledge Taylor and Francis Group.
e-Recourses	