

# **ANNAMALAI UNIVERSITY**

**(A State University Accredited with 'A' Grade by NAAC)**

## **MYAS – AU DEPARTMENT OF SPORTS SCIENCES**

**DIVISION OF SPORTS TRAINING  
*and*  
SPORTS NUTRITION**

### **M.Sc. Sports Nutrition**

**Programme Code: SSPO24**

### **REGULATIONS AND SYLLABUS**

**(For students to be admitted from academic year 2019-20 onwards)**

## **MISSION**

The mission of the Master of Science in Sports Nutrition program is to enhance the education of highly qualified Sports Nutrition professionals through an inter professional curriculum integrated with opportunities to excel in research, advanced professional skills, and leadership development; ultimately translating experiences into their respective professions and future employment opportunities. Opportunities for hands-on experiences are available at many premier sites in the community. The curriculum enhances fundamental concepts through advanced specific Nutritional needs for specific games while also including complementary subjects such as sports biochemistry and sports psychology. Our goals are to: equip students with a diverse and advanced knowledge base in the field of Sports Nutrition; instill confidence in student's practical skills; and develop professionals who can interpret and apply research in their practice.

## **AIMS**

The scientific application of Sports Nutrition, in sports-specific contexts, has emerged as one of the most vibrant study areas in recent years. The MSc in Sports Nutrition degree is a high-level blended learning course, which will enable. The mission of the Master of Science Sports Nutrition program is to enhance the education of highly qualified Sports Nutrition professionals through an inter professional curriculum integrated with opportunities to excel in research, advanced professional skills, and leadership development; ultimately translating experiences into their respective professions and future employment opportunities. This course is designed to enhance the students' current level of knowledge and expertise to an advanced level in the area of Sports Nutrition. The course will focus on the assessment and implementation of nutritional programs with strong emphasis on the areas of sports specific nutrition, clinical nutrition, nutritional counselling etc.

The Master of Sports Nutrition degree offers the opportunity for the individual seeking applied skills in Sports Nutrition to develop an inter professional approach to athlete development. Opportunities for hands-on experiences are available at many premier sites in the community. The curriculum enhances fundamental concepts through advanced Sports Nutrition courses while also including complementary subjects such as sports biochemistry and sports physiology. Our goals are to: equip students with a diverse and advanced knowledge base in the field of Sports Nutrition; instill confidence in student's practical skills; and develop professionals who can interpret and apply research in their practice.

This course provides an overview of Sports Nutrition. Emphasis is placed on the nutritional sciences (including human nutrition, exercise nutrition) and biochemistry, organization and administration, and testing and evaluation.

# REGULATIONS AND SYLLABUS

## REGULATIONS

(For students to be admitted from academic year 2019-20 onwards)

### UNDER CHOICE BASED CREDIT SYSTEM

#### M.Sc. SPORTS NUTRITION

### REGULATIONS AND SYLLABUS

(For students to be admitted from academic year 2019-20 onwards)

#### 1. Objectives:

Masters Degree in Sports Nutrition is a programme consists of core courses, discipline specific elective courses, generic elective courses and value added courses. Core courses and discipline specific elective courses are basic courses required for each programme. Generic elective courses are offered by the other Divisions in the Department of Sports Science as well as by other Departments in Annamalai University. Value added courses are offered by the Departments of other faculties (*i.e. except Faculty of Science*). A course is divided into five units to enable the students to achieve modular and progressive learning.

This programme is designed to:

- To acquaint students with the structure, function and interaction of nutrients and the concept of energy to maintain optimal health and fitness.
- To understand the basic functioning of human body and the role of different organs to maintain homeostasis.
- Students are trained to use different tools for assessing health and performance
- related fitness among athletes.
- To improve the communication skills of students through practicing various situations of nutrition communications and client handling.
- Students will be acquainted with nutrients and their timing in sports performance
- across varying intensities of training
- Understanding the basic physiology and nutrition/fuelling demands specific to a sporting event.
- Students get acquainted with chemistry, functions, metabolism and interrelationship between nutrients, energy balance and current trends of nutritional biochemistry and exercise.
- To understand Research Methods, Processing & Presentation of Data and Analysis
- Techniques using software programmes.

- To gain an understanding of tools used in research, study sampling and the various
- statistical analysis for qualitative research and interpretation.
- To understand the nutritional requirements and considerations for athletes with clinical conditions, special conditions and special dietary needs.
- To gain understanding of the various supplements and drugs used in sports and the nodal bodies for controlling doping.
- To understand the physiological adaptation and metabolic changes during exercise at varying intensities.
- To understand the various concepts of sports psychology, food psychology and health behaviour change to provide appropriate nutrition counselling and education.
- To gain knowledge on different types of food service layouts, styles of service and menus for food production.
- To identify and utilize relevant previous work that supports their research and to articulate a timely and important research question or creative objective.
- To identify and utilize appropriate methodologies to address the research question or creative objective and to meet the relevant field's standards for the responsible conduct of research, and effectively navigate challenges that arise in the research process.
- To work collaboratively with other researchers, demonstrating effective communication and problem-solving skills and to present the research effectively in a conference setting and a written publication

## 2. Definition of key words:

- **Programme:** An educational program leading to the award of a Degree, diploma or certificate.
- **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- **Semester:** Each semester consists of 15-18 weeks of academic work equivalent to 90 days of actual teaching days. The odd semester may be scheduled from July to December and even Semester from January to June.
- **CBCS (Choice Based Credit System):** It provides choice for students to select from the prescribed courses.
- **Course:** It is usually referred to as "Papers". All courses need not carry the same weight. A course may comprise lectures/tutorials/laboratory, work/field, work/outreach activities/project work/vocational training/viva/seminars etc or a combination of some of these.

- **Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching or two hours of practical work.
- **Core course:** Are course that are basic to the subject of the degree. This is a course which is to be compulsorily studied by a student as a core requirement to the completion of the program.
- **Elective Courses:** This is a course that is supportive to the discipline of study, provides an expanded scope, enables exposure to some other domains or nurtures proficiency/skills. Elective papers can be of two types: Discipline Specific Elective (DSE) and Generic Elective (GE). Core / DS Electives will not be offered as Generic Electives. Elective papers can be taken from MOOC courses and credit transfer should be allowed.
- Each of the Core courses and Discipline Specific Elective (DSE) shall be of 4credits. Credits under DSE may vary (16/12/8) depending upon the number of DSE courses offered across the semesters.
- **Discipline Specific Elective (DSE):** These courses are inter disciplinary in nature and considered similar to core course. And, the students have to choose one course from the option provided for them.
- **Generic Elective (GE):** These courses add generic proficiency to the students. Students have to choose generic elective courses in consultation with the head of the department from the Generic Elective courses offered by other Division of study in Sports Science or from other Departments in university.

### 3. Course Structure:

This **M.Sc. Sports Nutrition** is a programme consists of core courses, soft core courses, practical courses, internship and project work. The entire programme carries credit system. The number and distribution of credits for the programme will be decided by the respective faculties.

A programme is divided into two Semesters, Odd Semester and Even Semester. The normal Semester periods are:

Odd Semester: July to November (90 Working days)

Even Semester: December to April (90 Working days)

### 4. Credits:

The term credit is used to describe the quantum of syllabus for various courses in terms and hours of study. It indicates differential weight age given according to the contents and duration of the courses in the curriculum design. The minimum credit requirement for a two years Master's Programme shall be 90.

One credit of theory equals one lecture hour and

One credit of practical equals two laboratory hours.

### 5. Courses:

Each Programme may consist of Lectures / Tutorials / Laboratory Work / Seminar / Project Work / Practical Training Report / Viva-Voce etc. Normally, in each of the

programmes, credits will be assigned on the basis of the Lectures/Tutorials/Laboratory Work and other form of learning in a 18 week schedule.

#### **6. Eligibility for Admission:**

A candidate who has passed Bachelor's Degree in Sports Science / Sports Nutrition / Food and Nutrition / Food Technology / Food Science / Clinical Nutrition and Dietetics of Composite / General Home Science / Biochemistry / Pharmacy / Biotechnology / Microbiology / Chemistry / Agriculture / Dairy / Botany / Fisheries / Nursing / Bachelor of Ayurvedic Medicine & Surgery / Physiotherapy / B.H.M.S / B.S.M.S or equivalent thereto in 10+2+3 or 10+2+4 pattern from a recognized university with a minimum of 50% marks in aggregate.

#### **7. Grading System:**

The term grading system indicates a 10 point scale of evaluation of the performance of students in terms of marks, grade points, letter grade and class.

#### **8. Duration:**

The duration for completion of two Years Master's programme in any subject is four Semesters, but in any case not more than five years from the year of admission.

#### **9. Attendance:**

Every teaching faculty handling a course shall be responsible for the maintenance of Attendance Register for candidates who have registered for the course.

The instructor of the course must intimate the Head of the Department at least Seven Calendar Days before the last instruction day in the semester about the particulars of all students who have secured an attendance of less than 80%.

A candidate who has attendance less than 80% shall not be permitted to sit for the end-semester examination in the course in which the shortage exists.

However, it shall be open to the authorities to grant exemption to a candidate who has failed to obtain the prescribed 80% attendance for valid reasons on payment of a condonation fee and such exemptions should not under any circumstances be granted for attendance below 70%.

#### **10. Examination:**

There will be two sessional assessment tests and one End-Semester examination during each semester.

Sessional Test-I will be conducted after 35 working days and Sessional Test-II will be conducted after 70 working days.

Sessional Test-I will be a combination of a variety of tools such as class test, assignment and paper presentation that would be suitable to the course. This requires an element of openness. The students are to be informed in advance about the nature of assessment and the procedures. However, the tests are compulsory. Test-I may be for one hour duration. The pattern of question paper will be decided to the respective faculty. Sessional Test-I will carry 12.5% of marks of the entire course.

Sessional Test-II will be held after 70 working days for the syllabi covered between Seventh and Eleventh weeks.

Sessional Test-II will be conducted with a variety of assessment tools. It will also have an element of openness. The students are to be informed in advance about the nature of assessment and the procedures. However, the tests are compulsory. Test-II may be for

two hours duration. The pattern of question paper will be decided by the respective Faculty. Sessional Test–II carries 12.5% of marks of the entire course.

There will be one End–Semester Examination of 3 Hours' duration in each course. The end semester examination will cover all the syllabus of the course for 75% of marks.

Each course shall carry a maximum of 100 marks for the purpose of grading. The distribution of marks shall be as follows.

Theory Marks			Practical Marks		
Internal	External	Maximum	Internal	External	Maximum
25	75	100	40	60	100

### 11. Non-Credit Course

For the Non-Credit Courses offered in a Semester, a 'Satisfactory Participation Certificate' shall be issued to the Student from the concerned authorities, only after securing  $\geq 65\%$  attendance in such a Course. No credits, marks or Letter Grade shall be allotted for the non-credit course.

### 12. Internship and Field visit:

The Internship / Practical Training shall carry 100 marks and shall be evaluated through internal assessment only. At the end of Internship / Practical training / Summer Project, the candidate shall submit a certificate from the organization where he /she has undergone training and a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Department. Certificates (issued by the training centre or Organization) submitted by the candidate shall be attached to the mark list sent by the Head of the Department.

Field visit carry 100 marks and shall be evaluated through internal assessment only. At the end of field visit students has to submit the field visit report. Similarly, like internship evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Department. Certificates (issued by the training centre or Organization) submitted by the candidate shall be attached to the mark list sent by the Head of the Department.

### 13. Evaluation:

Evaluation will be done on a continuous basis. Evaluation may be by Objective Type Questions, Quiz, Short Answers, Essays or a combination of these, but at the end semester it has to be a written examination.

The performance of students in each course is evaluated in terms of percentage of marks (PM) with a provision for conversion to Grade Point (GP). The sum total performance in each semester will be rated by GPA while the continuous performance from the 2nd Semester onwards will be marked by (OGPA).

### 14. Marks and Grading:

A student cannot repeat the Sessional Assessment Test–I and Sessional Test– II. However, if for any compulsive reason the student could not attend the test, the prerogative

of arranging a special test lies with the teacher in consultation with the Head of the Department.

A minimum of 50% marks in each course is prescribed for a pass. A student has to secure 50% minimum in the End Semester Examination.

If a candidate who has not secured a minimum of 50% of marks in a course shall be deemed to have failed in that course.

The student can repeat the End Semester Examination when it is offered next in the subsequent Odd/ Even semesters till the regulations are in force. However, a candidate cannot move to the next semester if he/she has more than six papers as arrears at any point of time.

A candidate who has secured a minimum of 50 marks in all courses prescribed in the programme and earned a minimum of the credits will be considered to have passed the Master's Degree Programme.

### 15. Grading:

A ten point rating is used for the evaluation of the performance of the student to provide a letter grade for each course and overall grade for the Master's Programme. The letter grade assigned is given below:

Marks	Grade Point	Letter Grade	Class
90+	10	S	Exemplary
85-89	9.0	D	Distinction
80-84	8.5	D	Distinction
75-79	8.0	D	Distinction
70-74	7.5	A	First class
65-69	7.0	A	First class
60-64	6.5	A	First class
55-59	6.0	B	Second class
50-54	5.5	C	Second class
49 or less	-	F	Fail

The successful candidates are classified as follows:

I – Class 60% marks and above in over all percentage of marks (OPM).

II – Class 50–59% marks in over all percentage of marks.

Candidates who obtain 75% and above but below 91% of marks (OPM) shall be deemed to have passed the examination in First Class (Distinction) provided he/she passes all the course prescribed for the programme at the first appearance.

Candidates who obtain 90% and above (OPM) shall be deemed to have passed the examination in First Class (Exemplary) provided he/she passes the entire course prescribed for the programme at the first appearance.

For the Internal Assessment Evaluation the break up marks shall be as follows.

Test	10 marks
Assignment	05 marks
Case Study / Seminar / Short Answers etc.	05 marks
Attendance	05 marks
Total	25 Marks

## Marks for Attendance Percentage

90% and above	5 Marks
80 – 89%	4 Marks
70 – 79%	3 Marks

**16. Course–Wise Letter Grade:**

The percentage of marks obtained by a candidate in a course will be indicated in a letter grade. A student is considered to have completed a course successfully and earned the credits if he/she secures over all grades other than F. A letter grade F in any course implies a failure in that course. A course successfully completed cannot be repeated for the purpose of improving the Grade point.

The F Grade once awarded stays in the grade card of the student and is not deleted even when he/she completes the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the Odd/Even semester in which the candidates has appeared for clearance of the arrears.

A student secures F grade in any course which is listed as course as to repeat it compulsorily when the course is offered next. If it is an elective course, a student has the option to repeat it when it is offered next or to choose a new elective if he / she is chosen in the place of failed elective failed optional will be indicated as dropped in the subsequent grade card.

If a student secures F Grade in the Project Work/ Field Work/Practical Work/ Dissertation, either he/she shall improve it and resubmit it if it involves only rewriting incorporating the clarification of the evaluators of he/she can re–register and carry out the same in the subsequent semesters for evaluation.

**17. Withdrawal from the course by the student:**

Within two weeks from the date of commencement of the semester.

<b>M.Sc Sports Nutrition.</b>			
<b>Two-Year (4-Semester) CBCS Programme</b>			
<b>Basic Structure: Distribution of Courses</b>			
1	Core (C)	14 Papers of 4 Credit Hrs. each (Total Credit Hrs. 11x4)	56
2	Elective (E) Generic Elective Courses Value Added Courses	4 Papers of 3 Credit Hrs. each (Total Credit Hrs. 4x3)	12
3	Core Course Project Work Including Presentation, Comprehensive viva (D)	1 Activity of 3 credits Hrs. (Total Credit Hrs. 1x3)	3
4	Core Course Practical (P)	11Activities of 2 credits Hrs. each (Total Credit Hrs. 6x3)	22
5	Core Course Internship (I)	1 Activity of 2 credits Hrs. (Total Credit Hrs. 1x2)	02
6	Core Course Field Visit (FV)	1 Activity of 1 credit Hr. (Total Credit Hrs. 1x1)	01
	<b>Total Credit Hrs</b>		<b>96</b>



## MYAS-AU Department of Sports Sciences

Centre of Excellence

### M.Sc. Sports Nutrition

Two-Year (4-Semester) CBCS Programme

Programme Code: SSPO24

#### Programme Structure

(For students admitted from the academic year 2019-2020)

Course Code	Course Title	Hours/Week			Marks		
		L	P	C	CIA	ESE	Total
<b>Semester-I</b>							
19MSNC101	Core 1: Fundamentals of Human Nutrition	4		4	25	75	100
19MSNC102	Core 2: Basic Anatomy and Physiology	4		4	25	75	100
19MSCC103	Core 3: Assessment of health and fitness of athlete	4		4	25	75	100
19MSNP104	Core 4: Practical I:		8	3	40	60	100
19MSNP105	Core 5: Practical II:		8	3	40	60	100
	<b>Elective 1: Interdepartmental Elective</b>	3		3	25	75	100
				<b>21</b>	180	420	600
<b>Semester-II</b>							
19MSNC201	Core 6: Exercise nutrition and metabolism	4		4	25	75	100
19MSNC202	Core 7: Sports Specific Nutrition	4		4	25	75	100
19MSNC203	Core 8: Nutritional Biochemistry And Exercise	4		4	25	75	100
19MSNC204	Core 9: Research Methodology & Biostatistics	4		4	25	75	100
19MSNP205	Core 10: Practical III:		6	3	40	60	100
19MSNP206	Core 11: Practical IV:		6	3	40	60	100
	<b>Elective 2: Interdepartmental Elective</b>	3		3	25	75	100
	<b>Elective 3: Department Elective</b>	3		3	25	75	100
				<b>28</b>	230	570	800
<b>Semester-III</b>							
19MSNC301	Core 12: Clinical Sports Nutrition	4		4	25	75	100
19MSNC302	Core 13: Dietary Supplements And Ergogenic Aids	4		4	25	75	100
19MSNC303	Core 14: Exercise Physiology & Metabolism	4		4	25	75	100
19MSNI304	Core 15: Internship		6	4	25	75	100
19MSNP305	Core 16: Practical V:		5	3	40	60	100
19MSNP306	Core 17: Practical VI:		5	3	40	60	100
	<b>Elective 4: Interdepartmental Elective</b>			3	25	75	100
	<b>Elective 5: Department Elective</b>	3		3	25	75	100

			28	230	570	800
<b>Semester-IV</b>						
19MSNC401	Core 17: Sports Psychology And Nutrition Counseling	4	4	25	75	100
19MSNC402	Core 18: Food Service Management And Entrepreneurship	4	4	25	75	100
19MSNP403	Core 19: Practical VII: Training		5	2	40	60
19MSNP404	Core 20: Practical VIII:		5	2	40	60
19MSNPJ405	Project Work/In-plant training		8	4	25	75
			<b>16</b>	155	345	500
<b>Total Credits</b>			<b>93</b>			
<b>Value Added Courses</b>						

L- Lectures; P- Practical; C- Credits; CIA- Continuous Internal Assessment; ESE- End-Semester Examination

**Note:**

1. Students shall take both Department Electives (DEs) and Interdepartmental Electives (IDEs) from a range of choices available.
2. Students may opt for any Value-added Courses listed in the University website.

**Elective Courses**

S. No.	Course Code	Course Title	hours/week		C	Marks		
			L	P		CIA	ESE	Total
1.	19MSNE207.1	Obesity and Weight Management	3	0	3	25	75	100
2.	19MSNE207.2	Exercise Considerations for Special Populations	3	0	3	25	75	100
3.	19MSNE308.1	Biochemistry in Health and Disease	3	0	3	25	75	100
4.	19MSNE308.2	Fundamentals of Sports Sciences	3	0	3	25	75	100

**Department Electives (DE)**

**Interdepartmental Electives (IDE)**

S. No.	Course Code	Course Title	Department	Hours/week		C	Marks		
				L	P		CIA	ESE	Total
1.	19 SOSE 115.1	Soft Skills	English	3	0	3	25	75	100
2.	19 MATE 215.1	Discrete Mathematics	Mathematics	3	0	3	25	75	100
3.	19 MATE 215.2	Numerical Methods		3	0	3	25	75	100
4.	19 MATE 315.1	Differential Equations		3	0	3	25	75	100



### PROGRAM OUTCOMES (POs):

By the end of the program, the students will be able to

- PO1 : **Domain knowledge:** Demonstrate knowledge of basic concepts, principles and applications of the specific science discipline.
- PO2 : **Resource Utilisation.** Cultivate the skills to acquire and use appropriate learning resources including library, e-learning resources, usage of scientific sports training methods and testing methods to enhance knowledge-base and stay abreast of recent developments.
- PO3 : **Analytical and Technical Skills:** Ability to handle/use appropriate tools/techniques/equipment with an understanding of the standard operating procedures, safety aspects/limitations on diverse population with specific needs
- PO4 : **Critical thinking and Problem solving:** Identify and critically analyse pertinent problems in the relevant discipline using appropriate tools and techniques as well as approaches to arrive at viable conclusions/solutions.
- PO5 : **Project Management:** Demonstrate knowledge and scientific understanding to identify the purpose, design nutritional schedules, use appropriate methodologies, analyse and interpret data and provide solutions.
- PO6 : **Organisational skills:** Exhibit organisational skills and the ability to manage time and resources.
- PO7 : **Individual and team work:** Exhibit the potential to effectively accomplish tasks independently and as a sports nutritionist in diverse settings, and in goal specific settings.
- PO8 : **Ethics:** Commitment to professional ethics and responsibilities.
- PO9 : **Life-long learning:** Ability to engage in life-long learning in the context of the rapid developments in the discipline.
- PO10 : **Use of Technology:** Ability to utilize the available modern technology/Equipments/nutritional assessment in obtaining maximum positive results, demonstrate the ability to write dissertations, reports, make effective presentations and documentation.

### PROGRAM SPECIFIC OUTCOMES (PSOs):

By the end of the program, the students will be able to

- PSO1 : Understand principles of scientific sports nutrition to be applied in the field of performance enhancement.
- PSO2 : Understand the principles of nutrition and its effect on physical, physiological and psychological aspect of trainees.
- PSO3 : Understand and apply the principles of Exercise physiology, Biomechanics, Strength and conditioning and use them effectively in the planning and execution of nutritional strategies.

- PSO4 : Provide exposure in various supplementations/nutritional aids for team/ individual sports and to have an understanding on the effect of these methods individually and in combination on improvement of various performance capabilities.
- PSO5 : Applying the knowledge gained in designing supplementations/nutritional aids for different population with diverse needs.
- PSO6 : Provide exposure in various allied disciplines (Exercise physiology/Sports Biochemistry/Biomechanics/ Strength and conditioning).
- PSO7 : Provide exposure to modern experimental/theoretical methods for measurement, observation and assessment of various components of health/performance related fitness.
- PSO8 : Engage in research and life-long learning to adapt to changing environment.

### MAPPING OF PROGRAMME SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

By the end of the program, the students will be able to

Programme Specific Outcomes (PSOs)	Programme Outcomes (POs)									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	3	3	3	3	3	3	3	3	2	3
PSO2	3	3	2	3	3		3		3	
PSO3		3		3	3	3		3		3
PSO4	3		3	3	2	3				3
PSO5	3	3	3	3	3				3	3
PSO6	3			3					3	3
PSO7		2	3		3			3	3	3
PSO8	3	3	3	3	3	2	3		3	3

Semester	Credit	Internal (Marks)	External (Marks)	Total (Marks)
I	21	180	420	600
II	28	230	570	800
III	28	230	570	800

<b>IV</b>	<b>16</b>	155	345	500
<b>Total</b>	93	795	1905	<b>2700</b>

<b>SSPO24-M.Sc. Sports Nutrition (Semester I)</b>							
<b>19MSNC101- Fundamentals Of Human nutrition</b>							
<b>Course Code.</b>	<b>Course Title</b>	<b>Course Type</b>	<b>No. of Credit</b>			<b>Marks Split</b>	
			<b>Theory</b>	<b>Practical</b>	<b>Total</b>	<b>Int</b>	<b>Ext</b>
19MSNC101	<b>Fundamentals Of Human nutrition</b>	C – 1	4	0	4	25	75

### **Learning objective**

- To acquaint students with the structure, function and interaction of nutrients and the concept of energy to maintain optimal health and fitness.

### **Unit I -**

#### **Macronutrients**

**Introduction to Nutrition:** Definition; Nutrients; Food; Classification of nutrients; Role of nutrients.

**Carbohydrates:** Chemical composition; Properties; Classification; Sources; Functions; Digestion and Absorption of Carbohydrates; Transport; Utilization and Storage of Carbohydrates; Metabolic fate of dietary carbohydrates-Oxidation; Storage as glycogen and triglyceride; Glycaemic Index and Glycaemic Load; Consumption pattern of carbohydrates across various ethnicities; Dietary reference values for carbohydrate intake; Consequences of excess or deficient intake of carbohydrates.

**Dietary Fibre:** Components; Functions; Sources; Recommendations.

### **Unit II -**

#### **Proteins and Fat**

**Protein:** Chemical composition; Properties; Structural and Functional classification of protein; Amino acids and nitrogen compounds of the body; Functions; Role in growth and maintenance of life; Sources (Complete and Incomplete); Digestion, Absorption, Transport and Storage.

**Protein status of the body:** Protein turnover, protein status and degradation; Energy cost of protein turnover; Linear growth; Protein turnover in muscle and its control; Protein turnover during injury; Amino acid turnover; Formation and oxidation; Dietary proteins; Amino acid pool; Dynamic state of body proteins; Evaluation of Protein Quality; Deficiency and Excessive intake; Complementary value of proteins.

**Fat:** Chemical composition; Properties; Classification; Fatty Acids; Trans fats; Sources; Functions; Insufficient intake and Excessive intake of fats and oils; Fat Replacers; Digestion and Absorption of lipids; Transport and storage of Lipids; plasma lipids/ lipoproteins levels and risk.

### **Unit III -**

#### **Micronutrients**

**Vitamins:** Classification; Sources; Functions; Requirements; Transport, Utilization and Storage; Deficiencies and Toxicity of vitamins; Bioavailability and Bioconversion of Fat Soluble Vitamins.

**Minerals:** Classification; Sources; Functions; Requirements; Transport, Utilization and Storage; Deficiencies and Toxicity; Bioavailability of Major, Trace and Ultra Trace Minerals.

**Water and Electrolytes:** Distribution; Components of Body Fluids; Functions; Sources; Requirements; Regulation of water Balance; Abnormalities of water Imbalance; Electrolytes and Electrolyte Balance; Acid-Base Balance (Sodium and extracellular fluid-Significance and functions of sodium, amount and distribution in the body, sodium balance and depletion, Salt deficiency; Excess of body sodium; Potassium-Significance and functions; Amount and distribution in the body; Potassium balance and depletion; Excess of body potassium).

#### **Unit IV -**

**Energy intake and Energy expenditure:** Energy content of foods (chemical energy and metabolizable energy); Basal metabolism (Definition, protocol for measurement and factors affecting basal metabolism); Thermic effect of food (Definition, experimental approach and factors affecting thermic effect of food); Physical activity (Definition, experimental approach, factors affecting physical activity); Non-exercise activity thermogenesis-NEAT (Definition, experimental approach, factors affecting NEAT).

#### **Unit V -**

**Methods to assess energy cost:** Direct and indirect calorimetry; Measurement of energy expenditure; Principle; equipment; measurement and calculations; Food intake and energy balance method; Heart Rate monitoring; doubly labelled water technique.

**Energy balance and Energy requirement:** Concepts and basis; Adaption in energy expenditure-energy balance; Energy requirements across various age groups; Estimation of total energy needs across different age groups using factorial approach.

#### **Unit VI–Practical Implications**

Classification of commonly consumed food on the basis of the nutritional contents. Understanding the symptoms associated with specific nutritional deficiencies. understanding calorific values of various food items.

#### **Text Books:**

Bamji, M. S., Krishnaswamy, K., & Brahmam, G. N. V. (Eds.). (2009). *Textbook of human nutrition*. Oxford & IBH.

Gilchrist, J. M. (2003). *Introduction to Human Nutrition*. Blackwell Science Ltd, Oxford, United Kingdom.

Geissler, C., & Powers, H. (2009). *Fundamentals of Human Nutrition E-Book: for Students and Practitioners in the Health Sciences*. Elsevier Health Sciences.

#### **Supplementary Reading:**

Mann, J., & Truswell, S. (Eds.). (2017). *Essentials of human nutrition*. Oxford University Press.

Geissler, C., & Powers, H. (2005). *Human Nutrition with CD-Rom*. Churchill Livingstone.

Latham, M. C. (2002). *Human nutrition in the developing world* (Vol. 29). FAO.

### Course Outcomes

At the end of the course, the student will be able to

CO1: Understand what is carbohydrates and dietary fibers

CO2: Understand what is protein and fats.

CO3: Understand what is Micronutrients.

CO4: Understand the features of Energy intake and Energy expenditure

CO5: Understand the Methods to assess energy cost

CO6: Improved understanding of the role of different nutrients in the overall health and wellness of an individual.

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	-	-	-	-	3	3	-	3	-	-	3	3	3	3
CO2	3	-	3	-	-	2	3	3	-	3	3	3	-	-	3	3	-
CO3	3	-	3	-	-	-	3	3	-	3	3	3	2	-	3	3	-
CO4	3	-	3	2	-	-	3	3	-	3	3	3	-	2	3	3	-
CO5	3	-	3	-	2	-	3	3	-	3	3	3	-	-	3	3	-
CO6	3	-	3	-	-	-	3	3	-	3	3	3	-	-	3	3	-

19MSNC102- Basic Anatomy And Physiology							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC102	Basic Anatomy And Physiology	C – 1	4	0	4	25	75

#### Learning objective

- To understand the basic functioning of human body and the role of different organs to maintain homeostasis.

#### Unit I -

- Introduction of Basic Concepts of Anatomy and Physiology

- Structure and functions of cell.
- Tissues and their classification.
- Basic introduction of body systems.
- Anatomical and Physiological difference in Male and Female.

**Unit II -**

- Definition of physiology and its importance in the field of sports sciences
- Classification of Skeletal system.
- Types and structure of bones and joints.
- Different types of Movement around the joints.
- structure and Classification of Muscle
- Properties of Muscles
- Types of Muscular contraction
- Function of the Autonomic nervous system and Central nervous system. Reflex Action

**Unit III -**

- Constituents of blood and their function
- Blood groups and clotting of blood,
- The structure and properties of the heart

**Unit IV -**

- The Respiratory passage and exchange of gases in the lungs
- The Respiratory passage and exchange of gases in the lungs
- Mechanism of respiration (internal and external respiration)
- oxygen debt, second wind, vital capacity
- structure and functions of the digestive system,
- Metabolism.

**Unit V -**

- Effect of exercise and training on cardiovascular system.
- Effect of exercise and training on respiratory system.
- Effect of exercise and training on muscular system
- Physiological concept of physical fitness, warming up, conditioning and fatigue.
- Basic concept of balanced diet - Diet before, during and after competition.

## Unit VI–Practical Implications

Identify and differentiate different parts and segments of the body.- Identify and differentiate different joints and the bones attached to it. - Understanding different blood groups. – Measuring heart rate.

### Text Books:

Hall, J. E., & Guyton, A. C. (2015). Textbook of medical physiology.

Pocock, G., Richards, C. D., & Richards, D. A. (2013). *Human physiology*. Oxford university press.

Sherwood, L. (2015). *Human physiology: from cells to systems*. Cengage learning.

Sherwood, L. (2011). *Fundamentals of human physiology*. Cengage Learning.

Wright, D. B. (2000). *Human physiology and health*. Heinemann.

### Supplementary Reading:

Rerrot, T.V.: Anatomy for student and teacher of physical system. Tuttle, E.S.: Physiology.

Gupta, A. P. (2010). *Anatomy and physiology*. Agra: SumitPrakashan.

Gupta, M. and Gupta, M. C. (1980). *Body and anatomical science*. Delhi: Swaran Printing Press.

Guyton, A.C. (1996). *Textbook of Medical Physiology*, 9th edition. Philadelphia: W.B. Saunders.

Karpovich, P. V. (n.d.). *Philosophy of muscular activity*. London: W.B. Saunders Co.

Lamb, G. S. (1982). *Essentials of exercise physiology*. Delhi: Surjeet Publication.

Moorthy, A. M. (2014). *Anatomy physiology and health education*. Karaikud i: Madalayam, Pblcation.

## Course Outcomes

At the end of the course, the student will be able to

CO1: Understand the Basic Concepts of Anatomy and Physiology

CO2: Understand the structure and functions of the skeletal and muscular systems

CO3: Understand the structure and functions of the blood and circulatory system

CO4: Understand the structure and functions of the respiratory system and digestive system

CO5: Understand the effect of physical exercise training on different systems of the body.

CO6: Understand the role of physiological systems in maintenance of overall health and sports performances.

## Outcome Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	-	3	-	-	3	3	-	3	3	-	3	3	3	3	3
CO2	3	3	-	3	-	2	3	3	-	3	3	3	-	2	3	3	-
CO3	3	-	-	3	-	-	3	3	-	3	3	3	-	3	3	3	-
CO4	3	-	2	3	-	-	3	3	-	3	3	3	-	3	3	3	-
CO5	3	-	-	3	-	-	3	3	-	3	3	3	-	3	3	3	-

CO6	3	-	-	3	-	-	3	3	-	3	3	3	-	2	3	3	-
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19MSNC103: Assessment of Health and Fitness of Athletes							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC103	Assessment of Health and Fitness of Athletes	C – 3	4	0	4	25	75

### Learning objective

Students are trained to use different tools for assessing health and performance related fitness among athletes.

### Unit I - Assessment of Physique

**Kinanthropometry:** Definition; Introduction; Body size and proportion; Somatotyping; Circumferences; Skinfold measurement sites and determining body composition; Applications.

**Body Composition and Performance:** Factors that affect Body Composition; Assessment and Interpretation of Anthropometric and body composition data; Ideal Body Composition for Different Sports (Fat Mass and Fat Free Mass).

**Body Composition Assessment Techniques:** Direct, Indirect and Doubly indirect (Under Water Weighing, Dexa, Whole Body Conductivity, Skin folds, Bioelectrical Impedance, Total Body Potassium, Near Infrared Interactance).

### Unit II - Dietary Assessment of Athletes

**Different methods of dietary assessment (food and fluid intake):** Description; Advantages and Disadvantages; Applications; Assessing food and fluid intake while traveling.

**Special issues with dietary assessment in sports:** Diversity in intake; Training periodisation and food intake; Misreporting; Season and region specific dietary practices.

### Unit III - Estimation of dietary intakes:

Food data tables and software use; Evaluation of Nutrient Adequacy of Athletes' dietary intake; Methods for assessing food and fuel intake among athletes; Types of dietary assessment tools (Validity and reliability among athletes); Special concerns in assessing food intake among athletes; Translating the dietary intake data into analysis and determining nutritional information.

### Unit IV - Assessment of Physical fitness

**Functional tests:** Cardiorespiratory and muscular assessment; Type of measurement and protocol for evaluation and interpretation of performance; Aerobic Power or VO<sub>2</sub>max; Anaerobic Threshold; Economy of Movement.

**Fitness assessment:** Types of exercise, Components of physical fitness and its evaluation in health and performance.

**Activity Recording:** Self-reporting of activities vs. Direct monitoring of activities.

## Unit V - Biochemical and clinical assessment in sports

**Biochemical estimation:** Assessment of Lipids, Protein, Vitamin and Mineral Status.

**Clinical Assessment:** Signs and symptoms of various nutritional deficiencies.

**Assessment of Hydration:** Estimation of sweat loss and sweat rate; urine volume and indicators of dehydration (Water, Urine and Thirst).

## Unit VI–Practical Implications

Measuring body fat using skinfold calipers.- Assessment of BMI.- using dietary assessment tools. – Types and methods of fitness assessment

### Text Books:

Driskell, J. A., & Wolinsky, I. (Eds.). (2016). *Nutritional assessment of athletes*. CRCpress.

Eston, R., & Reilly, T. (Eds.). (2013). *Kinanthropometry and exercise physiology laboratory manual: tests, procedures and data: volumetwo: physiology*. Routledge.

ACSM's Health-Related Physical Fitness Assessment Manual.

### Supplementary Reading:

H Aile, L., Agher Jr, G. A., Ael, M., & J Robertson, R. (2016). *Perceived exertion laboratory manual*. Springer NewYork.

Heyward, V. H., & Gibson, A. (2014). *Advanced fitness assessment and exercise prescription* 7th edition. Humankinetics.

### Course Outcomes

At the end of the course, the student will be able to

- CO1: Understand the components of kinanthropometry and methods of assessing them.
- CO2: Understand the different methods of dietary assessment (food and fluid intake)
- CO3: Understand the different methods of estimation of dietary intakes
- CO4: Understand the different methods of assessment of different components of physical fitness.
- CO5: Understand the different methods of biochemical and clinical assessment in sports
- CO6: Students would be better equipped in handling and carrying out health and fitness assessments

### Outcome Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	-	3	-	-	3	3	-	3	3	-	3	3	3	3	3
CO2	3	3	-	3	-	-	3	3	2	3	3	3	-	-	3	3	-
CO3	3	-	2	3	-	-	3	3	-	3	3	3	-	3	3	3	-
CO4	3	-	-	3	-	-	3	3	-	3	3	3	2	3	3	3	-
CO5	3	-	-	3	-	-	3	3	-	3	3	3	-	3	3	3	-
CO6	3	-	-	3	2	-	3	3	-	3	3	3	-	-	3	3	-

<b>19MSNP104:Practical-I</b>							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
19MSNP104	Practical-II	C--4	0	3	3	40	60

### Learning objective

T To practically determine nutrient content in different food items.

### Course Contents

1. Estimation of total carbohydrate.
2. Estimation of moisture.
3. Estimation of dietary fibre.
4. Estimation of protein using micro kjeldahl method.
5. Estimation of fat using soxhlet extraction procedure.
6. Estimation of calcium.
7. Estimation of iron.
8. Estimation of beta-carotene.
9. Estimation of Vitamin C.
10. Estimation of polyphenols.

### Course Outcomes

At the end of the course, the student will be able to

- CO1: Estimate carbohydrate, moisture and dietary fiber.  
 CO2: Estimate selected minerals  
 CO3: Estimate selected vitamins and micronutrients  
 CO4: Well versed with techniques of estimation of different food items.

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	-	3	-	3	3	-	3	3	3	-	-	3	-	3

CO2	3	3	3	-	-	-	3	3	-	3	3	3	-	2	3	-	3
CO3	3	3	3	-	2	-	3	3	-	3	3	3	-	-	3	-	3
CO4	3	3	3	-	-	-	3	3	-	3	3	3	-	-	3	-	3

19MSNP105:Practical-II							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
19MSNP105	Practical-I	C-5	0	3	3	40	60

#### Learning objective

To practically evaluate the cardio respiratory functioning of human body, fueleconomy of carrying out an activity and fuel utilization within the body.

#### Course Contents

1. Measurement of blood pressure using traditional sphygmomanometer.
2. Determining Heart rate both manually and using heart rate monitors.
3. Handling and observing ECG and EEG monitors.
4. Pulmonary Function Test: Handling and monitoring using spirometer.
5. Measurement of running economy.
6. Combined measurement of running economy, lactate threshold and turn Point, and  $VO_2\max$
7. Measurement of loaded running efficiency
8. Measurement of the efficiency of cycling and stepping
9. The effects of load carriage on the economy of walking
10. Estimation of body surface area and Resting Metabolic Rate (RMR) from fat-free mass.
11. Assessment of the respiratory quotient (RQ).

#### Course Outcomes

At the end of the course, the student will be able to

CO1: Measure selected physiological parameters.

CO2: Assess basic fitness abilities.

CO3: Assess body surface area and Resting Metabolic Rate (RMR) from fat-free mass

CO4: Experienced in handling the various equipment to measure cardio respiratory functional parameters and fuel utilization.

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	-	3	-	3	3	-	3	3	3	-	-	3	-	3
CO2	3	3	3	-	-	-	3	3	-	3	3	3	-	-	3	-	3
CO3	3	3	3	-	2	-	3	3	-	3	3	3	-	-	3	-	3
CO4	3	3	3	-	-	-	3	3	-	3	3	3	-	-	3	2	3

### Inter Departmental Elective

Course No.	Course Title	Course Type	No. of Credit Hours			Marks Split	
			Theory	Practical	Total	Int	Ext
	Inter Departmental Elective	E- 1	3	0	3	25	75

\*Select one from the Generic Elective list Other than that offered by his/her parent Department) of the University.

### SSPO24-M.Sc. Sports Nutrition (Semester II)

#### 19MSNC201- Exercise Nutrition and Metabolism

Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC201	Exercise Nutrition and Metabolism	C - 6	4	0	4	25	75

#### Learning objective

Students will be acquainted with nutrients and their timing in sports performance across varying intensities of training.

## **Unit I - Type and Quantity of Macronutrient intake and its impact on sports performance**

**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 recreational sports.

**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.

## **Unit II - 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.

**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.

## **Unit III - 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 minerals; Requirements for athletes.

**Antioxidant:** Definition; Enzymatic and Non-Enzymatic antioxidants; Mode of action; Antioxidant effects to reduce oxidative stress; Effect on muscle contraction and exercise performance; Antioxidant deficiencies and exercise performance; Antioxidant requirements for exercise.

#### **Unit IV - Nutrient periodisation, meal timing and hydration among athletes**

**Nutrient periodisation and Meal timing:** Importance of periodisation and meal timing related to the type of training and exercise intensity; Effect of energy intake and co-ingestion of other nutrients like carbohydrate and protein composition before, during and after training; Importance of timing of carbohydrate intake; Type of carbohydrates and proteins beneficial for maximum refuelling post exercise sessions; Gender differences in carbohydrate, protein and fat refuelling strategies; Effect of high or low carbohydrate, protein and fat on training adaptation and performance; Periodisation of macronutrients based on the phase/season of training and strategies to be followed.

#### **Unit V - Hydration strategies:**

**Dehydration:** Causes; Symptoms and its effects on cardiovascular system and muscle metabolism; Tolerable levels of dehydration; Synergistic effect of dehydration and hyperthermia; Effects of dehydration on endurance performance; Methods for determining degree of dehydration among athletes; Strategies for lowering hyperthermia.

Beverage composition and formulation (isotonic, hypotonic and hypertonic); Only fluid versus fuelling with other macronutrients and electrolytes for exercise benefits; Beverage volume for maintaining euhydration with performance benefits; Beverage timing (Pre-exercise hydration, during exercise hydration protocol, Post-exercise rehydration); Factors that influence intake; Gastric emptying and absorption of fluids; Beverage palatability and fluid intake; Intravenous rehydration; Food versus fluid consumption during exercise.

#### **Unit VI – Practical Implications**

Understanding different types of food/supplementation for the improvement of strength, endurance, power and muscle development, - Understanding energy requirements for different types of activities. – Understanding nutritional periodization. – Understanding hydration, dehydration and hyperhydration

#### **Text Books:**

Maughan, R. J., & Shirreffs, S. M. (Eds.). (2013). Food, Nutrition and Sports Performance III. Routledge.

Campbell, B. (Ed.). (2013). Sports nutrition: enhancing athletic performance. CRC Press.

Marie Dunford. (2017) Nutrition for Sport and Exercise.

Jeukendrup, A. (2010). Sports Nutrition-From lab to Kitchen. Meyer & Meyer Sport.

Maughan, R. J., & Shirreffs, S. M. (Eds.). (2013). Food, Nutrition and Sports Performance III. Routledge.

#### **Supplementary Reading:**

Spano, M., Kruskall, L., & Thomas, D. T. (2017). Nutrition for Sport, Exercise, and Health. Human Kinetics.

Lanham-New, S. A., Stear, S., Shirreffs, S., & Collins, A. (Eds.). (2011). Sport and exercise nutrition (Vol. 8). John Wiley & Sons.

Lamprecht, M. (Ed.). (2014). Antioxidants in sport nutrition. CRCPress.

Fink, H. H., & Mikesky, A. E. (2017). Practical applications in sports nutrition. Jones & Bartlett Learning.

Wolinsky, I., & Driskell, J. A. (Eds.). (2005). Sports nutrition: vitamins and trace elements. CRCPress.

### Course Outcomes

At the end of the course, the student will be able to

- CO1: Understand the Type and Quantity of Macronutrient intake and its impact on sports performance
- CO2: Understand Macronutrients and Energy balance
- CO3: Understand the role of Vitamins and Minerals in exercise performance.
- CO4: Understand what is Nutrient periodisation, meal timing and hydration among athletes.
- CO5: Understand the Hydration strategies.
- CO6: Understand the role of different nutrients in sports performance and wellness of an individual athlete.

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	3	-	-	-	3	3	3	-	-	-	2	3	-	3
CO2	3	3	3	3	-	2	-	3	-	3	-	2	-	-	3	-	3
CO3	3	3	3	3	-	-	-	3	-	3	-	-	-	-	3	-	3
CO4	3	3	3	3	-	3	3	3	-	3	-	-	2	-	3	-	-
CO5	3	3	-	3	-	3	3	3	-	3	-	-	-	-	3	-	3
CO6	3	3	-	3	-	3	3	3	3	3	3	-	-	2	3	-	3

19MSNC202:Sports Specific Nutrition							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC202	Sports Specific Nutrition	C – 7	4	0	4	25	75

#### Learning objective

Understanding the basic physiology and nutrition/fuelling demands specific to a sporting event

### **Unit I - Nutrition for popular team sports (Hockey, Football, Volleyball, Kabaddi and Cricket)**

Playing position and rules of the game; Basic physiology of playing team sports; Physique mapping for each event (body composition).

Determining position wise fuel need for Training and Competition; 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

### **Unit II - Nutrition for Athletics, Racket Sports and Cyclic sports**

**Athletics (Sprinters, middle and long distance, field events):** Physiological variations and differences in energy systems; Fuel utilisation across various track and field events; Body composition; Dietary guidelines and nutrient requirements; Distribution of macronutrients in the diet; Guidelines for fuel during different phases of training and competition; Nutrient timing; Travel nutrition; Ergogenic aids commonly used for performance; Case studies of athletes.

**Racket sports (Badminton, Tennis, Squash):** Game dynamics and fuel utilisation (energy and macronutrients & micronutrients); Body composition; Energy demands of the game; Nutrient timing and dietary periodisation; Current research on racket sports; Tailored nutrition and Hydration guidelines pre, during and post training/competitions, Supplement or other ergogenic aids commonly used in racket sport; Recovery strategies; Case studies on racketsports.

**Nutrition for Endurance Sports (Long distance Swimming, Cycling and Marathon):** Characteristics; Physiology; Energy systems; Body Composition; Duration and intensity of event; Nutritional Requirements in Training and Competition; Dietary and Hydration Strategies; Use of Supplements; Case studies on endurance sports.

### **Unit III - Nutrition for Weight-dependent and balance sports**

**Strength and Combat sport (Wrestling, Weightlifting, Judo, Boxing, Taekwondo and Fencing):** Game dynamics; Fuel utilisation (energy and macronutrients); Case studies of Indian players; Energy demands of the game; Nutrient timing and dietary periodisation; Current research on strength & combat sport.

**Weight management issues:** Overemphasis on protein requirements; Tailored nutrition and hydration guidelines before, during and post-training/competitions; Supplement or other ergogenic aids; Recovery strategies (dietary and non-dietary components).

**Balance sports (Gymnastics, Golf):** Playing formats and Fuel utilisation (energy and macronutrients); Different energy demands of balance sport; Physique maintenance and weight management issues; nutrient timing and dietary periodisation; Current research on balance sports; Tailored nutrition and hydration guidelines before, during and post-training/competitions; Supplement or other ergogenic aids commonly used; Recovery strategies.

### **Unit IV - Nutrition for water sport and coordination sport**

**Water sports (Rowing, Kayaking):** Physiological and Biochemical changes in water sports; Research on water sports in relation to nutrition and dietary habits.

Common nutritional problems associated to water sports; Guidelines specific to nutrition in water sports; Identifying individual energy and other macronutrient requirements; Nutrient timing; Dietary periodisation; Supplement usage.

**Unit V - Coordination sport (Archery, Shooting):**

Playing formats and specific demands of the game; Eye-hand coordination; Current research relating nutrition and coordination sports performance; Maintaining proper fuel and hydration in coordination sport; Case studies of archers and shooters; Identifying the current nutritional problems; Dietary guidelines for pre, during and post training/competition, Supplement usage.

**Unit VI–Practical Implications**

Understanding the nature, rules, regulations, position play and specific fitness components predominating in different games and sports. Understanding the energy demands for various sports and games.

**Text Books:**

Maughan, R. J. (Ed.). (2008). Nutrition in sport (Vol. 7). John Wiley & Sons.

Fink, H. H., & Mikesky, A. E. (2017). Practical applications in sports nutrition. Jones & Bartlett Learning.

Eberle, S. G. (2013). Endurance Sports Nutrition, 3E. Human Kinetics.

Ryan, M. (2012). Sports nutrition for endurance athletes. VeloPress.

**Supplementary Reading:**

Campbell, B. (Ed.). (2013). Sports nutrition: enhancing athletic performance. CRC Press.

Reaburn, P. R. (Ed.). (2014). Nutrition and Performance in Masters Athletes. CRC Press.

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.

**Course Outcomes**

At the end of the course, the student will be able to

- CO1: Understand the Nutrition requirements for Hockey, Football, Volleyball, Kabaddi and Cricket.  
 CO2: Understand the Nutrition requirements for Athletics, Racket Sports and Cyclic sports  
 CO3: Understand the Nutrition requirements for Weight-dependent and balance sports  
 CO4: Understand the Nutrition requirements for water sport and coordination sport  
 CO5: Understand the Nutrition requirements for Coordination sport  
 CO6: Capable of handling and providing event-specific nutritional guidance.

**Outcome Mapping**

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	2	3	3	3	3	3	3	-	-	-	-	2	3	-	3
CO2	3	3	-	3	3	3	3	3	3	2	-	-	-	-	3	-	3
CO3	3	3	-	3	3	3	3	3	3	-	-	-	2	-	3	-	3

<b>CO4</b>	3	-	-	3	3	-	3	3	3	-	-	2	-	-	3	-	3
<b>CO5</b>	3	3	-	3	3	3	3	3	3	-	-	-	-	-	3	-	3
<b>CO6</b>	3	3	3	3	3	-	3	3	3	-	3	-	<b>2</b>	-	3	-	3

<b>19MSNC203:Nutritional Biochemistry and Exercise</b>							
<b>Course Code.</b>	<b>Course Title</b>	<b>Course Type</b>	<b>No. of Credit</b>			<b>Marks Split</b>	
			<b>Theory</b>	<b>Practical</b>	<b>Total</b>	<b>Int</b>	<b>Ext</b>
19MSNC203	<b>Nutritional Biochemistry and Exercise</b>	C – 8	4	0	4	25	75

### **Learning objective**

Students get acquainted with chemistry, functions, metabolism and interrelationship between nutrients, energy balance and current trends of nutritional biochemistry and exercise.

### **Unit I - Enzyme chemistry and hormones in macronutrient metabolism and energy production**

**Enzymes:** Structure; Composition; Nomenclature; Classification; Enzyme activity; Factors affecting enzyme activity; Role of co-enzymes; Enzyme kinetics; Enzyme inhibition; Drug and enzyme interactions; Regulation of enzyme activity; Enzymes of clinical significance.

**Hormones:** Chemistry; Regulatory system; Physiological function and nutrient interactions of Pituitary hormones (Growth Hormone, TSH, Vasopressin, Prolactin, Oxytocin, Corticotropin, Luteinizing Hormone, Follicle Stimulating Hormone); Thyroid and Parathyroid gland hormones (Thyroxine (T4), Triiodothyronine (T3), Calcitonin, Para Thyroid); Pancreatic Hormones (Glucagon, Insulin); Adrenal Glands (Adrenalin, Non-Adrenaline, Corticosteroids); Sex Hormones (Estrogen, Progesterone, Testosterone); Pineal gland (Melatonin).

**General introduction on energy states and anabolism/catabolism:** Phosphate energy (short) and oxidation-reduction reactions (long term) as energy sources; Role of glycolysis, gluconeogenesis, glycogenolysis, beta oxidation, Krebs cycle, HMP, ketone body formation, urea cycle and electron transport chain in energy (ATP) production; Biochemical changes during exercise performance; Biochemical characteristics of sub-cellular skeletal muscle during rest and activities.

### **Unit II - Nucleic Acids and Gene Expression**

**Biosynthesis and Degradation of Nucleotides:** Purine & Pyrimidine Metabolism; Bio Synthesis of Deoxy nucleotides.

**DNA & RNA:** Type; Structure; Metabolism; Transcription; Translation; Protein Biosynthesis and Turn Over.

**Gene Expression:** Basic Mechanisms; Regulation; Nutrient Gene Expressions

### **Unit III - Free Radicals, Immune Response, Aging**

**Free Radicals:** Introduction; Reactive Oxygen Species; Reactive Nitrogen Species; Oxidative Stress; Antioxidant defences (Endogenous & Exogenous).

**Immune Response:** Introduction; Types; Immune dysfunction; Effect of Malnutrition.

**Aging:** Theories; Damage to Mitochondria; Intervention in delaying aging; Genetic modules of aging, exercise and healthy aging, metabolic adaptation to exercise in aging.

#### **Unit IV - Inter Relationship between Nutrients & Drug-nutrient interaction**

**Inter Relationship between Nutrients:** Energy and B Vitamins; Fats and Vitamin A, D, E, K; Vitamin A and Zn; Vitamin E and Se; Fe and Protein; Vitamin C and Fe; Vitamin D and Ca, P; B-Complex and Mn, Mg, Co.

#### **Unit V - Drug Metabolism:**

Absorption; Metabolism; Excretion; Mechanism; Drugs as AntiMetabolites.

**Interaction between Nutrient and Drug:** Interaction between Food and Drugs; Nutrient and Drugs; Effect on Nutritional Status; Cytochrome P450; Mono OxidaseInhibitors.

#### **Unit VI–Practical Implications**

Understanding various micro nutrients and their role in performance enhancement. Understanding the different supplements for performance enhancements.

#### **Text Books:**

Mougiou, V. (2006). Exercise biochemistry. HumanKinetics.

Poortmans, J.R. (2004). Principles of Exercise Biochemistry, 3rd edition, KargerPublishers.

MacLaren, D., & Morton, J. (2011). Biochemistry for sport and exercise metabolism. John Wiley & Sons.

#### **Supplementary Reading:**

Brody, T. (1998). Nutritional biochemistry. Academicpress.

Tiidus, P., Tupling, A. R., & Houston, M. Biochemistry Primer for Exercise Science 4th Edition. HumanKinetics.

#### **Course Outcomes**

At the end of the course, the student will be able to

- CO1: Understand Enzyme chemistry and hormones in macronutrient metabolism and energy production
- CO2: Understand what is Nucleic Acids and Gene Expression
- CO3: Understand Free Radicals, Immune Response and Aging
- CO4: Understand the Inter Relationship between Nutrients & Drug-nutrient interaction
- CO5: Understand Drug Metabolism
- CO6: Students are able to understand the role of different nutrients in the overall health and wellness of an individual.

### Outcome Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	-	3	-	-	3	3	-	3	3	-	3	3	3	3	3
CO2	3	3	-	3	-	-	3	3	-	3	3	3	2	-	3	3	-
CO3	3	-	-	3	-	2	3	3	-	3	3	3	-	3	3	3	-
CO4	3	2	-	3	-	-	3	3	-	3	3	3	-	3	3	3	2
CO5	3	-	-	3	-	-	3	3	-	3	3	3	-	3	3	3	-
CO6	3	-	-	3	-	-	3	3	2	3	3	3	-	-	3	3	-

19MSNC204: Research Methodology & Biostatistics							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC204	Research Methodology & Biostatistics	C – 9	4	0	4	25	75

#### Learning objective

To understand Research Methods, Processing & Presentation of Data and Analysis Techniques using software programmes.

#### Unit I - Introduction & Research Design

**Research:** Definition; Significance of research; Steps in Research Process. Scientific Methods; Selection & Defining a Research Problem; Problems Encountered by Researchers.

**Research Design:** Features; Types of Research Designs; Basic Principles of Experimental Designs.

#### Unit II - Presentation & Processing of Data

**Presentation of Data:** Graphical presentation; Tabular; Chart; Diagrammatic presentation.

**Processing of Data:** Measures of Central Tendency (Mean, Mode, and Median); Measures of location (Quartiles, percentiles).

#### Unit III -Measures of Dispersion:

Range; Minimum; Maximum value; Quartile deviation; Mean Deviation; Standard Deviation; Coefficient of Variation; Skewness.

**Unit IV - Data Analysis**

**Correlation analysis:** Sample Correlation Analysis; Partial Correlation Analysis.

**Correlation analysis:** Multiple Correlation Analysis.

**Regression Analysis:** Simple Regression Analysis; Multiple Regression Analysis.

**Unit V - Computers and Software Programmes**

Introduction, designing graphs and charts.

Basics of computer operating systems; Spreadsheets. Software Programmes in Biomedical Statistics

**Unit VI–Practical Implications**

Doing simple measures of central tenancy manually. Using SPSS software. Preparation of charts, bar diagrams, pie diagrams

**Text Books:**

Kumar, S., & Phrommathed, P. (2005). Research methodology (pp. 43-50). SpringerUS.

Kothari, C. R. (2004). Research methodology: Methods and techniques. New Age International.

Neuman, W. L. (2013). Social research methods: Qualitative and quantitative approaches. Pearson education.

**Supplementary Reading:**

Marczyk, G., DeMatteo, D., & Festinger, D. (2005). Essentials of research design and methodology. John Wiley & SonsInc.

Runyon, R. P., Coleman, K. A., & Pittenger, D. J. (2000). Fundamentals of behavioral statistics. McGraw-Hill.

Thompson, B. (2006). Foundations of behavioral statistics: An insight-based approach. GuilfordPress.

**Course Outcomes**

At the end of the course, the student will be able to

CO1: Understand the different types of research.

CO2: Understand the different methods of research.

CO3: Understand the different types of experimental designs.

CO4: Understand the measures of central tendency and other statistical measures.

CO5: Understand the use of computers in research and the components of a thesis.

CO6: Enables Students to Learn Scientific Methods, Statistical Analysis Techniques Using Software Programmes and Manually.

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	3	3	-	-	-	3	-	-	-	-	-	-	-	3
CO2	3	3	3	3	3	-	-	-	-	3	-	3	-	-	2	-	3
CO3	3	3	3	3	3	-	-	2	-	3	-	3	-	-	-	-	3
CO4	3	3	3	3	3	-	-	-	-	3	-	3	-	-	-	2	3
CO5	3	3	3	3	3	-	2	-	-	3	2	3	-	-	-	-	3
CO6	3	3	3	3	3	-	-	-	2	3	-	3	-	-	-	-	3

<b>19MSNP205:Practical-III</b>							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
MSNP205	<b>Practical-III</b>	C--10	0	3	3	40	60

#### Learning objective

To practically determine event and phase specific total energy expenditure and hydration needs of athletes and to formulate a suitable menu considering type & timing of fluid intake corroborating with energy expenditure.

#### Course Contents

1. Menu planning and fluid intake during training and competition including nutrient periodisation for footballplayers.
2. Menu planning and fluid intake during training and competition including nutrient periodisation for hockeyplayers.
3. Menu planning and fluid intake during training and competition including nutrient periodisation forcricketers.
4. Menu planning and fluid intake during training and competition including nutrient periodisation forprinters.
5. Menu planning and fluid intake during training and competition including nutrient periodisation for marathonrunners.
6. Menu planning and fluid intake during training and competition including nutrient periodisation forbadminton.
7. Menu planning and fluid intake during training and competition including nutrient periodisation forrowing.
8. Menu planning and fluid intake during training and competition including nutrient

periodisation and weight-management for powersports.

9. Menu planning and fluid intake during training and competition including nutrient periodisation and weight-management for gymnastics.

10. Menu planning during training and competition including nutrient periodisation for archery..

### Course Outcomes

At the end of the course, the student will be able to

CO1: Plan menus for football, Hockey and Cricket players during training and competition..

CO2: Plan menus for endurance and power athletes during training and competition..

CO3: Plan menus for different categories of sports during training and competition..

CO4: Equipped to carry out estimation of energy expenditure across phases of training based on personalized training charts and preparation of diet charts for specific sports..

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	-	3	-	3	3	-	3	3	3	-	-	3	-	3
CO2	3	3	3	-	-	-	3	3	-	3	3	3	-	2	3	-	3
CO3	3	3	3	-	-	2	3	3	-	3	3	3	2	-	3	-	3
CO4	3	3	3	-	-	-	3	3	-	3	3	3	-	-	3	-	3

19MSNP206:Practical-IV							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
19MSNP206	Practical-IV	C-11	0	3	3	40	60

### Learning objective

To determine nutritional status among athletes.

### Course Contents

1. Estimation of Haemoglobin in blood samples.
2. Estimation of Glucose in blood samples.



19MSNE207.1	<b>Obesity and Weight Management</b>	E- 3	3	0	3	25	75
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### Learning objective

Develop a critical understanding and knowledge of the physiology and regulation of obesity and abnormal body weight

#### Unit I – Obesity:

Meaning and Definition of Obesity – Improved Food Guide Pyramid – Management – Exercise Issues – Exercise Prescription for Obesity.

#### Unit II – The physiology of the adipocyte and adipose tissue:

The role of adipose tissue as an endocrine organ as well as its role in health and disease.- The regulation of adipose tissue and energy balance - Appetite regulation and the role of adipose tissue.

#### Unit III – Reasons for Obesity:

Medical and genetic conditions that can cause obesity and weight gain - Other conditions predisposing to weight gain and obesity - Cushing Syndrome, hypothyroidism and pregnancy.

#### Unit IV - Avoidance of Obesity:

Life style modifications – Diet therapy - The concepts of Fitness , physical activity and fatness - Role of total daily activity in weight maintenance.

#### Unit V – Training methods for weight reduction:

*Role of resistance training and endurance training in obesity reduction- designing and execution of a training program for obese population- safety precautions*

#### Unit VI–Practical Implications

Understanding strength training schedules for weight reduction for males, females , children and older population. Understanding the sites of adipose tissues. Preparation and maintenance of body weight and body composition logs for different populations.

#### Text Books:

Liguori , ACSM's Resources for the Health Fitness Specialist, Human Kinetics Publishers.

Kumanyika , Handbook Of Obesity Prevention: A Resource For Health Professionals, Human Kinetics Publishers.

#### Supplementary Reading:

Marie Dunford, PhD, RD ,Fundamentals of Sport and Exercise Nutrition, Human Kinetics Publishers.

Kenneth L. Knight, Kirk Brumels,,Developing Clinical Proficiency in Athletic Training: A Modular Approach, Human Kinetics Publishers.

Steven B. Heymsfield, Timothy G. Lohman, ZiMian Wang, Scott B. Going, , Human Body Composition, Second Edition, Human Kinetics Publishers.

### Course Outcomes

At the end of the course, the student will be able to

CO1: Understand what is obesity and effect of exercise training on weight reduction.

- CO2: Understand the physiology of adiposity and weight gain.
- CO3: Understand the reasons for weight gain.
- CO4: Understand the ways and means of avoiding/reducing obesity
- CO5: A critical awareness of the of physical training on regulation of body weight , adipose tissue and its endocrine function.
- CO6: An in depth knowledge of the health benefits of exercise and its applicability in weight related conditions.

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	2	-	-	-	3	3	3	-	3	3	-	2	3	3	3
CO2	3	-	-	-	-	-	3	3	-	3	3	3	-	-	3	3	-
CO3	3	-	-	2	-	-	3	3	-	3	3	3	3	-	3	3	-
CO4	3	-	-	-	-	-	3	3	2	3	3	3	-	2	3	3	-
CO5	3	-	2	-	-	-	3	3	-	3	3	3	-	-	3	3	-
CO6	3	-	-	-	-	2	3	3	-	3	3	3	-	-	3	3	3

19MSNE207.2- Exercise Considerations for Special Populations							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
19MSNE207.2	Exercise Considerations for Special Populations	E – 3	4	0	4	25	75

#### Learning objective

Describe specific adaptations, advantages and precautions of various modes of training for physically active individual across the lifespan (e.g., pediatric to geriatric) and people with special needs

#### Unit I - Exercise Prescription for people with Hypo kinetic diseases:

Coronary artery disease,– Exercise Prescription for Heart Diseases – Weight Training guidelines for Heart Diseases - Coronary Artery Disease – Diabetes mellitus - Chronic Lung disease and Asthma – Management and Exercise Guidelines for persons with Hypertension, Diabetes mellitus and Cardiovascular Diseases– Management – Exercise Prescription for chronic lung Diseases and Asthma – Weight Training guidelines for Lung Diseases.

#### Unit II - Exercise issues related to Adolescence and Older adults:

Childhood and Adolescence – Old Age — Risks of Exercise in adolescents and elderly-Need and Importance of Exercise in Healthy Elderly –Strength training for children/ older adults and women - Strength Training forchildren - Strength training for olderadults

#### Unit III - Exercise issues related to Back pain and cervical spondylosis:

Meaning and Definition for Arthritis – Background – Management – Exercise Issues. Back pain and cervical spondylosis - Exercise recommendations for people with low back pain and cervical spondylosis.

#### **Unit IV - Exercise issues related to Females:**

Limitations faced by female population on doing physical activities- Pregnancy Strength training for females - Weight Training Guidelines for Pregnant women.

#### **Unit V - Exercise issues related to other health complications:**

Need and importance of exercise training for people with AIDS and Cancer – Exercise Prescription for AIDS and Cancer – Weight Training Guidelines. - Exercise Recommendations for Physically Inactive Individuals – Training Guidelines for Physically inactive individuals.

#### **Unit VI–Practical Implications**

Planning and Preparation of training schedule for primary prevention, secondary prevention and rehabilitation for people with hyper tension, diabetics, coronary heart disease, asthma and arthritics. Planning and Preparation of training schedule for pregnant women.

#### **Text Books:**

Dianne S. Ward, Ruth P. Saunders, Russell R. Pate, ,Physical Activity Interventions in Children and Adolescents, Human Kinetics Publishers.

Irene Lewis-McCormick , Woman's Guide to Muscle and Strength, Human Kinetics Publishers.

Cowlin ,Women's Fitness Program Development, Human Kinetics Publishers.

#### **Supplementary Reading:**

Deepak Jain , Physical and Drill Training for Children, Human Kinetics Publishers.

Dr. Pintu Modak ,Stretch and Relax, Human Kinetics Publishers.

#### **Course Outcomes**

At the end of the course, the student will be able to

- CO1: Understands the different hypo kinetic disease and the prescription of exercises for people suffering from those diseases.
- CO2: Understands the exercise issues related to Adolescence and Older adults.
- CO3: Understands the exercise issues related to Back pain and cervical spondylosis.
- CO4: Understands the exercise issues related to Females.
- CO5: Understands the exercise issues related to other health complications.
- CO6: Understanding the factors to be considered while designing and implementing a fitness program for special population with special needs.

#### **Outcome Mapping**

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	-	<b>2</b>	-	-	-	3	3	3	3	3	3	-	3	3	3
CO2	3	3	-	-	-	<b>2</b>	3	3	-	3	3	3	3	-	3	3	3

CO3	3	2	2	-	-	-	3	3	-	3	3	3	3	-	3	3	-
CO4	3	-	-	-	-	-	3	3	-	3	3	3	3	2	3	3	3
CO5	3	-	-	2	-	2	3	3	-	3	3	3	3	-	3	3	3
CO6	3	-	-	-	-	-	3	3	2	3	3	3	3	-	3	3	3

SSPO24-M.Sc. Sports Nutrition Semester-III							
19MSNC301: Clinical Sports Nutrition							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC301	Clinical Sports Nutrition	C – 12	4	0	4	25	75

#### Learning objective

To understand the nutritional requirements and considerations for athletes with clinical conditions, special conditions and special dietary needs.

#### Unit I - Athletes with Nutrition related disorders

**Diabetes and Cardiovascular disease:** Definition and description of diabetes mellitus; Physiological effect of exercise; Problems of athletes with type 1 diabetes and cardiovascular diseases; Physical activity prescription for athletes with type 1 diabetes and cardiovascular disease; high risk sport, insulin abuse and sport; Effects of long-term physical activity or exercise training on Insulin sensitivity; Acute effects of exercise in athletes with Type 1 diabetes and cardiovascular disease; Exercise in the presence of Hyperinsulinemia and Hypoinsulinemia; Medical nutrition therapy (MNT) for athletes with type-1 diabetes and cardiovascular disease; Dietary guidelines and Nutrient timing; type of carbohydrate and timing; Pre and post event carbohydrate loading and fluids; Insulin adjustments for athletes with type-1 diabetes; Special problems for athlete with Type-1 diabetes and cardiovascular disease; Complications with poorly controlled diabetes.

**Osteoporosis:** Definition and description; Causes and consequences; Physiological effects of exercise; Pathophysiology; Medical Nutrition Therapy.

**Sports Anaemia:** Definition and description; Causes and consequences; Physiological effects of exercise; Pathophysiology; Medical Nutrition Therapy.

**Athletes with gastrointestinal disorders, food allergies and food intolerance:** GI disturbance occur in some athletes before, during and after competition and training; Excessive flatulence; Abdominal distention; Intermittent diarrhoea; Constipation; Food related adverse reactions (FRAR); Physiological and dietary factors affecting gastric emptying and gut comfort; Gut trainability; Lower GI tract conditions; Irritable Bowel Syndrome (IBS); Low FODMAP diet for IBS; Composition, food sources of FODMAP and pattern of consumption; Coeliac disease (Diagnosis and treatment); Inflammatory bowel disease (IBD)-Diagnosis, Nutrition related concerns for athletes with untreated IBD; Medical Nutrition Therapy.

**Food-Related adverse reactions (FRAR):** FRAR includes Food allergy and Food intolerance; Diagnosis and Medical Nutrition Therapy; Recommendations for effective nutrition intervention for

athletes with FRAR.

## **Unit II - Nutrition for Special groups and Sports injuries**

**The Paralympic Athlete:** Athletes with physical or intellectual impairments (Classification and associated risk for injury or health outcomes); Body composition assessment and management; Eating difficulties and behaviours observed in some athletes with impairments.

**Paralympic athletes and nutritional demands:** Dietary intakes and potential issues; Reported dietary intakes; Fibre timing of food intake and bowel control; Fluid intake; Medicine requiring Therapeutic Use Exemption (TUE) under WADA; Use of vitamin, mineral or sports supplement; Travelling with Paralympic Athletes.

**Sport injury and rehabilitation:** Type of injury and rehabilitation required, Physiological and metabolic changes during injury and rehabilitation; Eating habits commonly followed during an injury; Overweight among injured athletes; Role of nutrition and dietary guidelines in recovery from an injury; Common injuries among athletes-Maxillofacial fractures, Knee injury, ACL tear, Patellofemoral syndrome, Tennis elbow, Ankle sprain, Groin pull, Hamstringsprain.

## **Unit III - Nutrition for athletes with special dietary needs**

**Children and adolescent athletes:** Growth and development; Nutritional issues commonly faced; Eating habits and addiction; Nutritional requirements for growth and training.

**Female athletes:** Vulnerability to nutrition assault and insufficiency; Differences in fuel or nutrient utilisation among female athletes; Female athletic triad (FAT) including eating disorder, menstrual irregularity and poor bone mineral density; energy availability-definition and its association with FAT; Assessment for FAT; Dietary guidelines and suggestions for FAT.

**Vegetarian athletes:** Classification; Nutritional status and dietary considerations; Nutritional gaps currently identified and suitable dietary modification for fuelling during training, competitions and travelling.

## **Unit IV - Altitude, Cold and Heat**

**Altitude training and Physiology:** Physiological changes and metabolic adaptation for high altitude training; Dietary recommendations at varied altitudes; Common Nutritional problems faced by athletes at high altitude.

**Cold and Heat:** Effect of Cold environment on dietary habits and recommendations for training and competing in cold environments; Special emphasis on hydration strategies; Effects of exercising in the heat; Heat stress and injury; Athlete performance and weight change while exercising in the heat; Strategic timing of water and electrolyte consumption during extreme climatic conditions.

## **Unit V - 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; Guidelines for preventing food borne diseases; Strategies for Treating Diarrhoea and Vomiting; Replacing fluid and electrolytes; Strategies to note for meeting dietary guidelines while traveling and follow up strategies.

## Unit VI–Practical Implications

Understanding the symptoms of food anemia and food allergy. Planning diet for athletes who are recovering from injury. Planning diet for athletes who are undergoing training and during competition period. Hydration issues and strategies.

### Text Books:

Burke, Louise, and Vicki Deakin. (2015). Clinical sportsnutrition. McGraw-Hill.

Broad, E. (Ed.). (2014). Sports Nutrition for Paralympic Athletes.CRC Press.

Maughan, R. J., & Shirreffs, S. M. (Eds.). (2013). Food, Nutritionand Sports Performance III.Routledge.

Campbell, B. (Ed.). (2013). Sports nutrition: enhancingathletic performance. CRCPress.

### Supplementary Reading:

Larson-Meyer, D. E. (2007). Vegetarian sports nutrition. HumanKinetics.

Marie Dunford. (2017) Nutrition for Sport andExercise.

LeMura, L. M., & Von Duvillard, S. P. (Eds.). (2004). Clinical exercise physiology: application and physiological principles. Lippincott Williams& Wilkins.

Cheung, S. (2010). Advanced environmental exercise physiology.Human Kinetics.

### Course Outcomes

At the end of the course, the student will be able to

CO1: **Understand the nutrition related disorders ofathletes**

CO2: Understand the nutritional requirements for Special groups and Sports injuries

CO3: Understand the nutritional requirements for athletes with special dietary needs

CO4: Understand the nutritional requirements at Altitude, Cold and Heat conditions

CO5: Understand the Medical and Nutritional Issues faced by Travelling Athlete

CO6: Gaining knowledge about the various clinical conditions of sports persons andproviding suitable dietary modifications and guidelines

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	-	-	-	-	-	3	-	3	3	3	-	-	3	3	-
CO2	3	3	-	3	-	2	3	3	3	3	3	3	2	-	3	3	3
CO3	3	3	-	3	-	-	3	3	-	3	3	3	-	-	3	3	3
CO4	3	3	3	3	-	-	3	3	3	3	3	3	-	2	3	3	3
CO5	3	3	3	3	-	-	3	3	3	3	3	3	-	-	3	3	3

CO6	3	3	3	3	-	2	3	3	3	3	3	3	-	-	2	-	3
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19MSNC302: Dietary Supplements and Ergogenic Aids							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC302	Dietary Supplements and Ergogenic Aids	C – 13	4	0	4	25	75

### Learning objective

To gain understanding of the various supplements and drugs used in sports and the nodal bodies for controlling doping.

### Unit I - Nutritional supplements: Evolution into ergogenic aids or drugs among athletes and government regulations.

**Dietary supplement:** Definition and classifications; Ergogenic aids: Definitions and Classifications; Dietary Supplement Health and Education Act of 1994; Government Protections from Dietary Supplement Hazards and Risks; New Dietary Ingredients; FDA Regulatory Action: Ephedra Supplements and DMAA; FDA Regulatory Actions: Androstenedione, Piracetam, and ATD; Contaminated Supplements and Banned Ingredients; Anabolic Steroid Control Act and Designer Anabolic Steroid Control Act; Adverse Event Regulation and Legislation; Contamination or Adulteration: A Need for Better Consumer Confidence.

**Doping control and Supplement testing:** World anti-doping agency 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.

### Unit II - Macronutrient Supplements

**Protein Supplements:** Whey, Casein, Egg Albumen, Soy Protein, Pea Protein & Other Vegan Proteins/Protein Blends), Protein Bars, Protein shakes Amino Acid Supplements- BCAA, Glutamine, Arginine, Taurine.

**CHO Supplements:** Carbo loading, Sports Drinks, Bars and Gels.

**Fat Supplements:** Omega Fatty acids, Medium Chain TCG, Fish Oils.

### Unit III - Micronutrient Supplements

**Vitamin Supplements:** B-Complex Vitamins, Vitamin C, Vitamin D, Vitamin E Supplements, Multi-Vitamin Supplements.

**Mineral Supplements:** Calcium-Magnesium-, Iron Supplements, Chromium, Zinc.

**Antioxidants Supplements:** Antioxidants Vitamins & Mineral Supplements.

#### **Unit IV - Metabolite and Botanical Ergogenic Supplements**

**Botanical Ergogenic Supplements:** Wheat Germ oil, Beetroot, Green Tea Extract, Tart Cherries, Caffeine, Curcumin, Phytosterols, Bio Flavonoids, Ashwagandha, Rhodiola, Shilajit, Ginseng, Grape Seed Extract, chyawanprash, Herbal Testosterone-Boosters (Eg. Tribulus Terrestris, Nettle Root, Long Jack Root Etc), Bitter Orange (Citrus aurantium), Capsaicin, White Kidney Bean (Phaseolus vulgaris), Garcinia Cambogia (Hydroxycitric Acid), Guar Gum, and Psyllium, Glucomannan.

#### **Unit V - Metabolite Ergogenic Supplements:**

Beta-Alanine, L-Carnitine Co Enzyme Q 10, Creatinine, DHEA, NADH, Glycerol, Inosine, Melatonin, Gamma Oryzanol (Ferulates), FRAC, Glucosania, Alcohol, Adaptogens, Alkalinizers, Androstenedione, B HMB.

**Use of Nutritional Supplements in Sport and Exercise:** Motivational Antecedents and behavioural Outcomes: Motivational Theories Applied to Supplement Use; Behavioural Effects of Selected Supplements Commonly Employed for Performance, Fitness, and Health

#### **Unit VI – Practical Implications**

Planning and implementing effective supplementation strategies. Understanding dope control and banned chemicals. Understanding macro and micro nutrient supplementations

#### **Text Books:**

Antonio, J., & Stout, J. R. (2002). Supplements for endurance athletes. Human Kinetics.

Greenwood, M., Cooke, M. B., Ziegenfuss, T., Kalman, D. S., & Antonio, J. (Eds.). (2015). Nutritional supplements in sports and exercise. Humana Press.

#### **Supplementary Reading:**

Cooper, C. E. (2008). Drugs and ergogenic aids to improve sport performance. Essays in biochemistry, 44, 1-10.

#### **Course Outcomes**

At the end of the course, the student will be able to

- CO1: Understand the evolution of ergogenic aids or drugs among athletes and government regulations
- CO2: Understand the different types of macronutrient Supplements
- CO3: Understand the different types of micronutrient Supplements
- CO4: Understand the different types of metabolite and botanical ergogenic supplements
- CO5: Understand the different types of metabolite ergogenic supplements
- CO6: Guiding the athlete on supplements and drugs, including doping control practices

### Outcome Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	-	-	2	-	-	3	-	3	3	3	-	-	3	3	-
CO2	3	3	-	3	-	-	3	3	3	3	3	3	-	-	3	3	3
CO3	3	3	-	3	-	-	3	3	-	3	3	3	-	2	3	3	3
CO4	3	3	3	3	-	-	3	3	3	3	3	3	-	-	3	3	3
CO5	3	3	3	3	-	2	3	3	3	3	3	3	-	-	3	3	3
CO6	3	3	3	3	-	-	3	3	3	3	3	3	-	-	-	2	3

19MSNC303: Exercise Physiology & Metabolism							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC303	Exercise Physiology & Metabolism	C – 1	4	0	4	25	75

#### Learning objective

To understand the physiological adaptation and metabolic changes during exercise at varying intensities.

#### Unit I - Introduction to Exercise Physiology

**Introduction:** Definitions of terminologies (Work, Power, speed, strength, efficiency etc.); Types of exercise (aerobic and anaerobic) and limiting factors, Exercise intensity and duration.

**Adaptations to exercise:** Physiological and metabolic adaptations to training; Muscle hypertrophy and performance; Endurance versus resistance training and performance; Training adaptations and maladaptation and detraining.

**General principles of training:** Exercise response (Modality, Intensity, Duration, categories, response patterns and interpretation); Exercise training (Health and sports related fitness, Dose-response relationship, training principles, periodization); Metabolic training principles and adaptations (specificity, overload, rest/recovery/adaptation, progression, individualization, maintenance, retrogression, warm-up and cooldown).

#### Unit II - Adaptation of Respiratory and Cardiovascular Systems to exercise

**Respiratory responses during exercise at varying intensities:** Overview of pulmonary system and circulation; Factors effecting pulmonary ventilation and diffusion; Transport of gases in blood and blood doping; Gas exchange at the muscle; Respiratory limitations to performance (oxygen deficit and steady state); Acid-base balance; Factors limiting Maximal Oxygen Uptake in athletes.

**Respiratory responses across various types of exercise and environment conditions:** Short-term, light to moderate submaximal aerobic exercise; Long-term, moderate to heavy submaximal aerobic exercise; Incremental aerobic exercise to maximum static exercise; Entrainment of respiration at rest; Influence of sex and age on respiration at rest and during exercise; Respiratory muscle training principles and adaptations; Whole body respiratory training principles and adaptations (Lung volumes and capacities, pulmonary ventilation, external and internal respiration, detraining and the respiratory system); Special considerations (during altitude change and/or pollution).

**Cardiovascular responses to exercise:** The heart, vascular system and hormonal

control of blood volume, cardiovascular dynamics; regulation of the cardiovascular system (neural control, anatomical sensors and neuro-hormonal control); Changes in Cardiovascular variables (cardiac output, stroke volume, heart rate, maximal oxygen consumption and blood pressure) during exercise; Cardiovascular responses to aerobic exercise; Cardiovascular responses to static exercises and dynamic exercises; Cardiovascular responses to exercise across gender, in children and older adults; Cardiovascular adaptation to aerobic endurance training and dynamic resistance; Detraining effects on cardiorespiratory system

### **Unit III - Metabolic adaptation to exercise, Fluid balance and Thermoregulation**

**Energy Production:** ATP and Cellular respiration (Carbohydrate, fat and protein metabolism); Intracellular and extracellular regulation of cellular respiration and ATP Production; Fuel utilisation during rest and exercise.

**Anaerobic and aerobic metabolism during exercise:** Alactic and Lactic acid levels in energy production; Anaerobic exercise response; Measurement of anaerobic metabolism; Response to anaerobic exercise (Oxygen deficit and excess post exercise oxygen consumption); ATP-PC Changes and lactate changes; Time frame for lactate removal post exercise; Anaerobic exercise response in male versus female, children, older adults (availability and utilization of ATP-PC, accumulation of lactate, mechanical power and capacity); Aerobic metabolism during exercise (oxygen and carbon-di-oxide production, oxygen cost of breathing, RER, Estimation of calorie expenditure, MET, Field estimates of energy expenditure, efficiency and economy).

### **Unit IV - Adaptation of skeletal muscle, endocrine and immune system in training**

**Fluid balance and Thermoregulation:** Exercise in environmental stress; Measurement of environmental condition; Measurement of body temperature; Thermal balance; Heat exchange; Exercise in the heat; Cardiovascular demands of exercise in the heat; Influence of sex and age on the exercise response to heat; Exertional heat illness syndromes; Exercise in cold; Cold induced injuries; Cold tolerance across age and sex; Maintaining fluid balance.

**Skeletal system:** Functions; Regulation of blood calcium; Levels of organization; Bone development; Factors influencing bone health; Skeletal adaptation to exercise training and detraining; Special applications in osteoporosis; Female athletic triad; Skeletal injuries.

**Unit V - Skeletal muscle and neuromuscular system:** Functions; Characteristics; Macroscopic and microscopic structure; Molecular structure of the myofilaments; Contraction and muscle fibre types; Importance of muscle fibre types in athletes; Skeletal muscle force production; Fatigue and muscle soreness; Measuring muscle function; Influence of age and sex on muscle function; Skeletal muscle oxygen consumption and interplay between aerobic and anaerobic respiration; Neuromuscular aspects of movement; The nervous system (basic structure and activation of nerve cell, neural control of muscle contraction, reflex control of

movement, volitional control of movement, flexibility); Physiological response to stretching; Application of training principles to flexibility; Adaptation to flexibility training and balance; Neuromuscular adaptation to resistance training and detraining, Muscular adaptation to

concurrent training.

**Endocrine and immune response:** Hormonal system; Role of endocrine system in exercise; Hormonal responses to exercise; Hormonal adaptation to training; Immune system structure and function; Functional organisation; Immune response to exercise across various intensities and/or duration of exercise; Cytokine response to exercise; Neuroendocrine control of immune response to exercise.

### Unit VI–Practical Implications

Measurement of resting heart rate. Measurement of maximum heart rate.. Measurement of recovery heart rate. Recording and plotting heart rate. Variations. Measurement of systolic and diastolic blood pressure. Measurement of body temperature. Understanding thermo regulation. Understanding the different types and benefits of stretching.

### Text Books:

Christopher B. Scott. (2010). A Primer for the Exercise and Nutrition Sciences: Thermodynamics, Bioenergetics, Metabolism. Humana Press.

Raven, P., Wasserman, D., Squires, W., & Murray, T. (2012). Exercise Physiology: An Integrated approach. Nelson Education.

ACSM's Resources for Clinical Exercise Physiology: Musculoskeletal, Neuromuscular, Neoplastic, Immunologic and Hematologic Conditions by American College of Sports Medicine

Powers, S. (2014). Exercise physiology: Theory and application to fitness and performance. McGraw-Hill Higher Education.

Smith, D. L., & Fernhall, B. (2011). Advanced cardiovascular exercise physiology. Human Kinetics.

### Supplementary Reading:

Farrell, P. A., Joyner, M., & Caiozzo, V. (2011). ACSM's advanced exercise physiology.

Cheung, S. (2010). Advanced environmental exercise physiology. Human Kinetics.

Hale, T. (2005). Exercise physiology: a thematic approach (Vol. 5). John Wiley & Sons.

Ehrman, J. K., Kerrigan, D., & Keteyian, S. (2017). Advanced Exercise Physiology: Essential Concepts and Applications. Human Kinetics.

McArdle, W. D., Katch, F. I., & Katch, V. L. (2015). Exercise physiology: nutrition, energy, and human performance. 8th Edition, Lippincott Williams & Wilkins.

### Course Outcomes

At the end of the course, the student will be able to

CO1: Understand the basics of Exercise Physiology

CO2: Understand the adaptation of Respiratory and Cardiovascular Systems due to exercise

CO3: Understand the metabolic adaptation to exercise, Fluid balance and Thermoregulation

CO4: Understand the adaptation of skeletal muscle, endocrine and immune system due to training

CO5: Understand the Skeletal muscle and neuromuscular system

CO6: Enables the students to gain an overall understanding of human body functioning during exercise and thus provide appropriate nutrition/fuel..

### Outcome Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	-	3	-	-	3	3	-	3	3	-	3	3	3	3	3
CO2	3	3	-	3	2	-	3	3	-	3	3	3	-	-	3	3	-
CO3	3	-	-	3	-	-	3	3	-	3	3	3	-	3	3	3	-
CO4	3	-	2	3	-	-	3	3	-	3	3	3	-	3	3	3	2
CO5	3	2	-	3	-	-	3	3	-	3	3	3	2	3	3	3	-
CO6	3	-	-	3	-	-	3	3	-	3	3	3	-	-	3	3	-

### MSNI304 - Internship (Semester-III)

Course No.	Course Title	Course Type	No. of Credit Hours			Marks Split	
			Theory	Practical	Total	Int	Ext
MSNI304	Internship	I-1	0	2	2	40	60
<b>Learning objective</b>							
<b>Learning outcomes</b>							

### MSNP305:Practical-V

Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
MSNP305	Practical-V	C--10	0	3	3	40	60

#### Learning objective

To plan and develop diet plans for athletes with clinical condition, special dietary needs and Paralympics athletes.

#### Course Contents - Clinical Sport Nutrition

1. Planning a year round diet for an athlete with diabetes.
2. Planning a year round diet for an athlete with sports anaemia.
3. Planning a year round diet for an athlete with Food-Related adverse reactions
4. Planning a year round diet for an athlete with sports injury.
5. Planning a year round diet for a Paralympic athlete.
6. Planning a year round diet for vegetarian athletes.

7. Conducting an Eating attitudes test (EAT) for female athletes to assess eating disorder.
8. Nutrition strategies and menu planning for athletes in different altitude.
9. Nutrition strategies and menu planning for athletes in different climatic conditions
10. Nutrition guidelines/suggestions for athletes while travelling and to overcome jetlag.
11. Planning a diet during traveling, including fluid intake strategies

### Course Outcomes

At the end of the course, the student will be able to

CO1: Prepare diet plans for athletes with specific health issues

CO2: Prepare diet plans for athletes undergoing injury rehabilitation.

CO3: Prepare nutrition strategies and menu planning for athletes in different climatic conditions.

CO4: Equipped to prepare dietary charts specific to athletes' conditions or special needs

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	-	3	-	3	3	-	3	3	3	-	-	3	-	3
CO2	3	3	3	-	-	-	3	3	-	3	3	3	-	2	3	-	3
CO3	3	3	3	-	2	-	3	3	-	3	3	3	-	-	3	-	3
CO4	3	3	3	-	-	-	3	3	-	3	3	3	-	-	3	2	3

<b>MSNP306: Practical-VI</b>							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
MSNP306	<b>Practical-VI</b>	C-11	0	3	3	40	60

### Learning objective

To have a thorough understanding of the various types of supplements available in the market through market surveys and also to prepare diet plans inclusive of supplement dosages.

### Course Contents

1. Development and standardisation of a sports bars or meal replacement bars.
2. Composition and brand names of supplements that improve Muscle mass commonly available in the market and role of nutrients listed in athletic performance.

3. Composition and brand names of carbohydrate supplements commonly available in the market.
4. Composition and brand names of fat supplements commonly available in the market.
5. Composition and brand names of supplements micronutrients commonly available in the market.
6. Composition and brand names of metabolite supplements commonly available in the market.
7. Composition and brand names of botanical supplements commonly available in the market.
8. Planning a diet for strength athletes with supplements for muscle building.
9. Planning a diet for endurance athletes with supplements for energy and micronutrients.
10. Providing diet for clinical conditions with supplement usage (Planning the type, quantity and timing of supplement intake).

### Course Outcomes

At the end of the course, the student will be able to

- CO1: Understand the composition and brand names of supplements that improve Muscle mass
- CO2: Understand the Composition and brand names of supplements micronutrients commonly available
- CO3: Able to Plan a diet for strength athletes and endurance athletes
- CO4: Well versed with dietary supplements available in the market, their benefits and disadvantage

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	-	3	-	3	3	-	3	3	3	-	-	3	2	3
CO2	3	3	3	-	2	-	3	3	-	3	3	3	-	-	3	-	3
CO3	3	3	3	-	-	-	3	3	2	3	3	3	-	-	3	-	3
CO4	3	3	3	-	-	-	3	3	-	3	3	3	-	-	3	2	3

Inter Departmental Elective							
Course No.	Course Title	Course Type	No. of Credit Hours			Marks Split	
			Theory	Practical	Total	Int	Ext
	Inter Departmental Elective	E- 4	3	0	3	25	75

\*Select one from the Generic Elective list Other than that offered by his/her parent Department) of the University.

19MSNE307.1:Biochemistry in Health and Disease							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
19MSNE307.1	Biochemistry in Health and Disease	E – 5	3	0	3	25	75

### Learning objective

To understand changes in the biomolecules during health and disease conditions

### Unit I - Automation in the clinical biochemistry:

Precision, reliability, reproducibility and other factors in quality control. Normal values in health and diseases, radio isotopes in diagnosis; Specimen collection and processing (blood, urine and feaces); Storage of specimens; Quality control; Pre-analytical, analytical post analytical variables in quality analysis.

### Unit II - Kidney, liver and gastric function tests-

Renal function tests,osmolarity and free water clearances, acute and chronic renal failure,Liver function tests : clinical features and test based on excretory functions, metabolic capacity of liver, synthetic functions of liver, serum enzymes.Gastric function tests: collection of gastric contents, examination of gastric residium, FTM, stimulation tests, tubeless gastric analysis.

### Unit III - MetabolicDisorders:

Carbohydrate metabolism: Diabetes mellitus, insulin receptors and C-peptide, assay of insulin, proinsulin and insulin antibodies. Hemoglobin A1C, fructosamines, insulin tolerance test, Glycogen storage diseases, galactosemia ,fructosuria, pentosuria; plasma lipids and lipoprotein abnormalities: hypercholesterolemia- lipidosis and hypolipoproteinemias, Taysachs and Niemann Picks diseases. Disorders of nucleic acid metabolism-hypo and hyperuricemia, gout; Disorders of erythrocyte metabolism- hemoglobinopathies, thalassemias and anemias.

### Unit IV - Inherited MetabolicDisorders:

Newborn screening: PKU, tyrosinemia, aminoacidurias, organic acidurias, porphyrias. Biochemical monitoring of therapy; prenatal diagnosis of inborn errors of metabolism, amniotic fluid and fetal blood examination; Acetylcholinesterase and other tests on amniotic fluid; chromosomal abnormalities by cytogenetics.

### Unit V - Molecular diagnosis of genetic defects:

Diagnosis of genetic diseases by molecular biology techniques (cystic fibrosis, Hemachromatosis, thalassemias, sickle cell diseases) DNA probes; restriction fragment length polymorphism (RFLP); polymerase chain reaction (PCR); amplification of mRNA. AIDS, Clinical diagnosis. Oncogenic enzymology: acid phosphatase, alkaline phosphatase, lactate dehydrogenase. Body fluid

constituents of use in oncology

### Unit VI–Practical Implications

Understanding different methods of specimen collection. Understanding clinical diagnosis and screening. Understanding different diagnostic and estimation methods. Familiarizing with different diagnostic equipments and procedures.

#### Text Books:

Notes on Clinical Biochemistry by John K. Candlish (1992) publisher: World Scientific Publishing Company

Clinical Biochemistry: Metabolic And Clinical Aspects by William J. Marshall, Stephan K. Bangert, Elizabeth S.M. Ed. S.M (ed) Marshall (2008) Publisher: Elsevier Science Health Science Div

Biochemistry by John K. Joseph (2006) Publisher: Campus Books International.

#### Supplementary Reading:

Basic Medical Biochemistry: A Clinical Approach by Dawn B PH.D. Marks, Allam D. Marks colleen M. Smith (1996) Publisher; Lippincott Williams & Wilkins; illustrated edition.

Clinical Chemistry, 6/e 1e by William J Marshall, Stephen K Bangert(2008) Publisher: Else.

**Tictz fundamental of clinical Chemistry, 6/e by Carl A Burits, Edward R Ashwood (2008) publisher: Else.**

#### Course Outcomes

At the end of the course, the student will be able to

CO1: Understand the use of automation in the clinical biochemistry

CO2: Understand the Kidney, liver and gastric function tests

CO3: Understand the Metabolic Disorders

CO4: Understand the Inherited Metabolic Disorders

CO5: Understand the Molecular diagnosis of genetic defects

CO6: Enables Students to learn the normal values of all biochemical parameters

#### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	-	-	-	-	-	3	3	3	3	3	3	-	3	3	3
CO2	3	3	-	2	-	-	3	3	-	3	3	3	3	-	3	3	3
CO3	3	-	-	-	-	-	3	3	-	3	3	3	3	2	3	3	2
CO4	3	-	2	-	-	2	3	3	2	3	3	3	3	-	3	3	3
CO5	3	-	-	-	-	-	3	3	-	3	3	3	3	-	3	3	3
CO6	3	-	-	2	-	-	3	3	-	3	3	3	3	2	3	3	3

<b>19MSNE307.2: Fundamentals of Sports Sciences</b>							
<b>Course Code.</b>	<b>Course Title</b>	<b>Course Type</b>	<b>No. of Credit</b>			<b>Marks Split</b>	
			<b>Theory</b>	<b>Practical</b>	<b>Total</b>	<b>CIA</b>	<b>ESE</b>
19MSNE307.2	<b>Fundamentals of Sports Sciences</b>	E – 3	3	0	3	25	75

### **Learning objective**

To examine the advanced methods and techniques associated with the design of strength and conditioning programs to enhance human performance in sport and fitness.

Develop a sport-specific resistance training program that includes training frequency, load, exercise type, and progression

Understand how to increase in muscular strength, power, endurance and hypertrophy through a weight-training program.

Focus on how to lift weight using proper form, control, safety and full range of motion by combining multi-joint and single joint exercises.

Name and describe various weight lifting exercises as they relate to anatomical muscles groups.

### **Unit I - Effect of exercise on different systems of the body :**

Effect of Exercise on Circulatory system – Respiratory system – Oxygen debt, forced expiratory volume, Breathing capacity, Vital Capacity, Recovery and second wind, Endocrine system. Effect of aerobic endurance training on Heart rate, Heart size, Blood Pressure, Blood Distribution, Lungs Volume, Respiratory Rate, Maximal Oxygen uptake and Lactic Acid.

### **Unit II -**

#### **Metabolism during exercise:**

Energysubstances - Basic energy systems: ATP-PC, glycolysis and oxidative phosphorylation - Aerobic and anaerobic power—concept, factors affecting it - Respiratory quotient, O<sub>2</sub> debt. Metabolic Equivalent - Energy expenditure during rest and exercise - Techniques to measure energy expenditure - Muscle fatigue and recovery - Lactate threshold, OBLA, Lactate tolerance

#### **Unit III –Injury Prevention**

Managing injuries (types of injuries, preventing injuries, treating & rehabilitating injuries. - Overtraining, preventing overtraining and treating overtraining - Rehabilitation & Reconditioning.

### **Unit IV – Principles of Sports Training**

. Meaning of the terms Unit, Session, Micro Cycle, Meso Cycle and Macro Cycle - Periodization of training process - Nature and Definition of Peak form, Training state and Periodization - Peaking and Periodization - Physiologic al basis of Periodization - Periodization models - Types of Periodization - Aims and contents of different periods - Periodization of strength training - Periodization of speed training - Periodization of endurance training - Integrated Periodization.

**Unit V -**

Biomechanical principles involved in basic movements – biomechanical analysis of walking, running, jumping, hitting, throwing climbing and swimming. Work Capacity under Different Environmental Conditions : Hot – Humid – Cold – High Altitude

**Unit VI–Practical Implications**

Preparation of logs for body weight and body composition measurements. Preparation of training schedule. Scheduling activities with progression in load.. Measurement of aerobic and anaerobic power,

**Text Books:****Supplementary Reading:****Course Outcomes**

At the end of the course, the student will be able to

- CO1: Understand the effect of sports training on different systems of the body  
 CO2: Understand the different energy systems and metabolism.  
 CO3: Understand the different types of sports injuries and how to treat them  
 CO4: Understand the basic principles and concepts of sports training.  
 CO5: Understand the different biomechanical principles involved in basic movements  
 CO6: Understand the basic components of sports science.

**Outcome Mapping**

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	-	-	-	-	-	3	3	3	3	3	3	-	3	3	3
CO2	3	3	-	-	-	2	3	3	-	3	3	3	3	2	3	3	3
CO3	3	-	-	-	2	-	3	3	-	3	3	3	3	-	3	3	-
CO4	3	-	2	-	-	-	3	3	2	3	3	3	3	-	3	3	3
CO5	3	-	-	-	-	-	3	3	-	3	3	3	3	-	3	3	3
CO6	3	-	-	-	-	2	3	3	-	3	3	3	3	-	3	3	3

**SSPO24-M.Sc. Sports Nutrition  
Semester-IV**

<b>19MSNC401: Sports Psychology and Nutrition Counselling</b>							
<b>Course Code.</b>	<b>Course Title</b>	<b>Course Type</b>	<b>No. of Credit</b>			<b>Marks Split</b>	
			<b>Theory</b>	<b>Practical</b>	<b>Total</b>	<b>Int</b>	<b>Ext</b>
19MSNC401	<b>Sports Psychology and Nutrition Counseling</b>	C – 17	4	0	4	25	75

### **Learning objective**

To understand the various concepts of sports psychology, food psychology and health behavior change to provide appropriate nutrition counseling and education.

### **Unit I - Important concepts in Sports Psychology**

**Motivation:** Definition; Interactional approach; Goal setting; Strategies to enhance motivation; Goal orientation; Reinforcement; Positive approach; Intrinsic and Extrinsic motivation; Mental preparation.

**Attention Concept and Thought management:** Definition; Ways in which athletes lose concentration; Concentration principles and thought management strategies.

**Management of competitive stress and athletes responses:** Relationship between anxiety and sports performance; Stress management intervention; Restructuring approach; Tools to assess stress among athletes; Mental preparation.

### **Unit II - Important concepts in Food psychology**

**Effect of psychology on eating behaviour and food choices:** Models of food choices; Neuropsychology and food choices; Food choices across life span.

**Biological and Learning Influences on Food Choice:** Biological influences on energy intake; Food Neophobia in humans; Role of learning in development of food preferences; Mood, Emotions and Food choice; Food cravings and Addictions.

**Societal Influences on Food Choice:** Marketing parameters and their Influence on consumer food choice; Role of context in food choice; Food acceptance and Food consumption; Impact of the media on food choice; Impact of advertising on food choice.

### **Unit III - Concepts of Health Behaviour change psychology**

**Theories of behaviour change-Part A:** Usefulness of theories in behaviour change; Health Belief Model; Theory of Reasoned Action/Theory of Planned Behaviour Self-Efficacy; The Trans theoretical Model.

**Theories of behaviour change-Part B:** Self-Determination Theory; Motivational Interviewing; Social Cognitive Theory; Dual-Process Models; Social Support/Social Networks; Diffusion of Innovations; Ethics of BehaviourChange.

### **Unit IV - Behaviour modification strategies to influence eating habits and health outcomes:**

Impact of optimistic bias on dietary behaviour; Implementation intentions; Strategic Automatization of food choice; Use of the Stages of Change Model with dietary behaviours; Addictive behaviour assessment and strategies to overcome, General behavioural assessment and psychological testing tools.

### Unit V - Nutrition counselling and education

**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.

### Unit VI–Practical Implications

Understanding the features of counseling. Different techniques of counseling. Understanding the techniques of behavioral analysis. Understanding the relationship between emotional issues and food consumption.

#### Text Books:

- Shepherd, R., & Raats, M. (Eds.). (2006). The psychology of food choice (Vol. 3). Cabi.  
 Tenenbaum, G., & Eklund, R. C. (Eds.). (2007). Handbook of sport psychology. John Wiley & Sons.

#### Supplementary Reading:

- Luiselli, J. K., & Reed, D. D. (Eds.). (2011). Behavioral sport psychology: Evidence-based approaches to performance enhancement. Springer Science & Business Media.

### Course Outcomes

At the end of the course, the student will be able to

- CO1: Understand the important concepts in Sports Psychology  
 CO2: Understand the important concepts in Food psychology  
 CO3: Understand the concepts of Health Behavior change psychology  
 CO4: Understand the behavioral modification strategies which influence eating habits and health outcomes:  
 CO5: Understand the features of nutrition counseling and education  
 CO6: Gaining a better understanding of client's psychology and then providing nutrition guidance.

### Outcome Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	-	3	-	-	3	3	-	3	3	-	3	3	3	3	3
CO2	3	3	-	3	-	2	3	3	-	3	3	3	-	-	3	3	-

CO3	3	-	-	3	-	-	3	3	-	3	3	3	-	3	3	3	-
CO4	3	-	-	3	-	2	3	3	-	3	3	3	-	3	3	3	2
CO5	3	-	2	3	-	-	3	3	-	3	3	3	2	3	3	3	-
CO6	3	-	-	3	-	-	3	3	-	3	3	3	-	2	3	3	-

19MSNC402: Food Service Management and Entrepreneurship							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	Int	Ext
19MSNC402	Food Service Management and Entrepreneurship	C – 18	4	0	4	25	75

### Learning objective

To gain knowledge on different types of food service layouts, styles of service and menus for food production.

### Unit I - Institutional Food Service Management Introduction:

Historical perspective; Challenges ahead. Planning to setting up a food service unit; Management of food service and Personnel; Administration.

**Food service area Layout:** Kitchen Spaces (Size and type of spaces, developing kitchen plans, designing kitchens, storage and maintenance); Storage Spaces (Types, planning of storage spaces, sanitation, safety and security); Service Areas (Planning of a service area, dimensions, décor & dining).

### Unit II - Food service management – Quality assessment

**Quantity of Food Preparation:** Menu planning; Sequence of courses; Menu display; Preparation for service; Standardization of recipes; Portion control; Left over foods; Recipe modification; Selection & storage; Standards for selection of fresh food; Substitutes, convenience or ready-to-eat food purchase and storage.

**Unit III - Quality of Food Service:** Objectives (variety and nutrition balance); Food preferences; Timing; Type of service; Different ages, gender, cultural background and specific for sports.

**Food safety standards, Quality control and Laws:** FDA; FSSAI; Concept of Hazard Analysis Critical Control Point (HACCP).

### Unit IV - Sanitation and Hygiene

**Environmental hygiene** (Site, structure, equipment, furniture and fittings, ventilation, lighting, water supply, waste disposal).

**Hygiene in food handling** (Receiving food materials, storage, prevention and control of infestation, preparation centre, cooking, holding, serving, disposal and personal hygiene of a food handler).

**Safety** (Accidents in food service areas, safety procedures, training, educating, legal responsibility of food service manager).

## Unit V - Entrepreneurship, Sports Facility & Event Management

**Entrepreneurship:** 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; Legal aspects of Business; Business statistics; Sports financial management; Corporate social responsibility.

**Strategic Management:** Product & Brand management; Sports marketing tools; Sports analytics management (software, sports sponsorships & funding, business negotiations skills).

## Unit VI–Practical Implications

Understanding the factors to be considered in developing kitchen plans, designing kitchens and storage facilities. Menu planning for different needs and population. Understanding Product & Brand management. Understanding latest and relevant marketing techniques and strategies.

### Text Books:

Payne-Palacio, J. (2016). *Foodservice Management: principles and practices*. Pearson Education.

Motarjemi, Y., & Lelieveld, H. (Eds.). (2013). *Food safety management: a practical guide for the food industry*. Academic Press.

Sullivan, C. F., & Atlas, C. (1998). *Health care food service systems management*. Jones & Bartlett Learning.

### Supplementary Reading:

Puckett, R. P. (2012). *Foodservice manual for health care institutions* (Vol. 150). John Wiley & Sons.

Ciletti, D., & Chadwick, S. (2012). *Sports Entrepreneurship: Theory and Practice*. Fitness information Technology.

### Course Outcomes

At the end of the course, the student will be able to

CO1: Understand the fundamentals of institutional Food Service Management

CO2: Understand the essentials of Food service management

CO3: Understand the essentials of Quality of Food Service

CO4: Understand the essentials of Sanitation and Hygiene

CO5: Understand the features of Entrepreneurship, Sports Facility & Event Management

CO6: Imparts skills in establishing and operating a food service industry.

### Outcome Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
CO1	3	3	-	-	2	-	-	3	-	3	3	3	-	-	3	3	-

CO2	3	3	-	3	-	-	3	3	3	3	3	3	-	-	3	3	3
CO3	3	3	-	3	-	2	3	3	-	3	3	3	-	-	3	3	3
CO4	3	3	3	3	-	-	3	3	3	3	3	3	2	-	3	3	3
CO5	3	3	3	3	-	-	3	3	3	3	3	3	-	-	3	3	3
CO6	3	3	3	3	-	-	3	3	3	3	3	3	-	-	-	2	3

<b>MSNP403:Practical-VII</b>							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
19MSNP403	Practical-VII	P- 19	0	3	3	40	60

### Learning objective

To practically use and interpret the various questionnaires available for psychological assessment.

### Course Contents - Sports Psychology and Nutrition Counselling

1. Using Rate of perceived exertion using Borg's scale.
2. Learning to use the EAT questionnaire to determine eating disorder.
3. Assessment of Self-esteem of an athlete using Rosenberg questionnaire.
4. Estimation of anxiety using physical activity and sport anxiety scale.
5. Estimation of competitive anxiety using trait anxiety inventory.
6. Estimation of depression using BDI-II Beck's depression inventory (version 2).
7. Estimation of negative affectivity using the positive and negative affect scale.
8. Estimation of anticipation time.
9. Estimation of reaction time.
10. Estimation of IQ and attention using Wechsler Adult Intelligence Scale.

### Course Outcomes

At the end of the course, the student will be able to

- CO1: Estimate different psychological parameters
- CO2: Understand the techniques of using questionnaire and inventories.
- CO3: Estimate anticipation time and reaction time
- CO4: Enable students to provide effective nutrition education by understanding of psychology individual athlete.

### Outcome Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	3	3	-	3	-	3	3	-	3	3	3	2	-	3	-	3
CO2	3	3	3	-	-	-	3	3	-	3	3	3	-	-	3	-	3
CO3	3	3	3	-	2	-	3	3	-	3	3	3	-	-	3	2	3
CO4	3	3	3	-	-	-	3	3	-	3	3	3	-	-	3	-	3

<b>19MSNP404:Practical-VIII</b>							
Course Code.	Course Title	Course Type	No. of Credit			Marks Split	
			Theory	Practical	Total	CIA	ESE
19MSNP404	<b>Practical-VIII</b>	P- 20	0	3	3	40	60

#### Learning objective

To practically understand the food safety standards and protocol to be adopted in a food service management and also qualities of an entrepreneur.

#### Course Contents - Food Service Management and Entrepreneurship

1. Identifying the critical control points in a food servicesetting.
2. Identifying the calculation for in-stock and out-of-stock foodproduct.
3. Learning to use the variousinventories.
4. Developing an SOP for production, handling and storage offoods.
5. Recipe development and quantity cookery.
6. Visit to any food serviceindustry/institution.
7. Visit to any sports institution's food service and dining facility to understand the food handling and hygienepactices.
8. Prepare a design and layout of a sports specific restaurant and suggesta brandname.
9. Planning a menu including nutrition labeling for a sport specificrestaurant.
- 10.Prepare costing for each item in the menu for a sport specificrestaurant

#### Course Outcomes

At the end of the course, the student will be able to

- CO1: Understand the basic requirements of the food service industry.
- CO2: Understand the techniques of production, handling and storage offoods
- CO3: Understand the techniques of Planning a menu including nutrition labeling

CO4: Enable students to identify and solve issues relating to hygiene and sanitation. Further, to understand the qualities of an entrepreneur.

<b>19MSNPJ405 - Project Work including Presentation, Comprehensive Viva</b>							
<b>Course Code.</b>	<b>Course Title</b>	<b>Course Type</b>	<b>No. of Credit</b>			<b>Marks Split</b>	
			<b>Theory</b>	<b>Practical</b>	<b>Total</b>	<b>CIA</b>	<b>ESE</b>
19MSNPJ405	<b>Project Work including Presentation, Comprehensive Viva</b>	PJ-1	0	4	4	25	75

#### **Learning objective**

Each student will develop a sport-specific Nutrition program. The project should include an introduction discussing the sport and player's nutritional need, a comprehensive analysis of the available research literature, the methodology adopted in data collection and experimentation, the analysis of the Data, Results and the final conclusion.

#### **Learning outcomes**

Thesis has to be taken by the student with latest problems related to sports Training methods.

The report should be structured in the following way.

- Title page
- Acknowledgements
- Abstract
- Main text
- Introduction
- Literature review
- Methods
- Results
- Discussion
- Conclusion
- Recommendations
- References
- Appendices

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