

Department of Sports Physiology

SYLLABUS M.A. (Sports Physiology)

(Under Credit Based Continuous Evaluation Grading System)



Rajiv Gandhi University
Rono Hills :: Doimukh

(Approved by the Ministry of Youth Affairs and Sports Government of India)

Note:

1. Copyrights are reserved.
2. Nobody is allowed to print it in any form. Defaulters will be prosecuted.
3. Subject to change in the syllabi at any time. Please visit the University website time to time.

A. Theory (Examination)

Instructions to Paper Setters:

The paper setters should set 8 questions (of equal marks), two in each of the four sections (Section A to D, corresponding to the distribution in the syllabi). Further, the paper setters shall be instructed to make sub-sections (not exceeding 4) of the questions and allocate appropriate marks to 34each section. The candidates shall be asked to attempt five questions by selecting one question from each section and the fifth question may be attempted from any section.

* 1 hr of theory and dissertation is counted as 1 credit. 2 hr of practical /clinical training is counted as 1 credit.

B. Practical Examination

Practical examination of 31 credits of M.Sc (Exercise and Sports Physiology) (includes SHP401, SHP451/453, SHP501/503 and SHP551/552) will be conducted once at the end of 4th semester which includes assessment of skill of performing practical (according to detailed syllabus), its report generation and submitting practical file, viva-voce etc.

Practical Attachments:

To enable the students to acquire practicing in hand on skills, maximum emphasis will be laid on regular practical classes, demonstration and clinical practice. The students will undergo Clinical / Field training in GNDU Campus / Sports Authority of India (Various Centres), National Institutes of Physiotherapy, Government Medical College Amritsar, other sporting centres and to the coverage of various tournaments as and when required and decided by BOC. The students will attend on field training which consists of early morning hours and evening late hours inclusive of weekends.

C. Dissertation

At the end of first semester students are expected to have a research proposal ready. At the end of second semester students are expected to be familiar with equipment handling and pilot study. At the end of third semester data collection, analysis & results should be completed. In fourth semester the work should be presented in the form of final dissertation and manuscript should be ready for communication. The student will be awarded grade for the total number of credits earned in dissertation in I, II, III and IV semesters of study at the end of the IV semester.

* The credits earned by a candidate in practical and dissertation during different semesters will be evaluated at the end of the 4th semester and the grade will be determined accordingly.

* A candidate shall be required to maintain minimum of 5.62 SGPA at the end of each semester. A student getting 'C' or lower grade in any course in this discipline will be treated as having failed in that course and shall have to repeat the core/elective courses/or repeat/opt. another course in lieu of interdisciplinary/outside department course with approval of Board of Control, and will have to obtain at least 'C+' grade in that course within specified period as per the prevailing rules. The weights of 'C' and lower Grades will not be counted in SGPA or CGPA (according to syndicate proceeding, dated: 24.5.2010, para no. 34).

* Interdisciplinary/Optional Course: to be offered from outside the department.

(Semester-I)
M.Sc. - Sports Physiology
(Under Credit Based Continuous Evaluation Grading System)

SPH-511 (C): FUNDAMENTALS OF EXERCISE PHYSIOLOGY

Unit – I Cardiovascular & Respiratory Aspects of Exercise Physiology

Cardiovascular Aspects:

1. Overview of the heart, blood vessels, and blood composition, Heart size in the athlete & normal; difference in strength/power trained vs Endurance trained heart, Acute HR, BP, SV, a-v-O₂ diff, cardiac output, blood flow responses to exercise at various intensities; from rest to maximal.

2. Chronic adaptations to endurance exercise training; various modes of training with respect to: Heart rate, Blood pressure, Stroke volume, Cardiac output, a-v-O₂ difference, Vascularization and exercise training, Blood pressure responses to exercise, Determination of lactic acid and pyruvic acid in blood before and after exercise, Determination of Hemoglobin level before and after exercise, Anaerobic power test (*Margaria* method), Measurement of flexibility, agility, power and maximal work capacity, Determination of VO₂ max by: Direct method, Queen's college step test, 12 min-run tests, Non Exercise Test, *Astrand* rhyming nomogram method

3. Hemodynamics: Circulation and its control, Determinants of blood flow, Cardiovascular regulation and control mechanisms, Factors determining cardiac performance: preload, afterload, contractility, HR, EDV, ESV, Regulation of blood volume in sudden loss of blood Hemostasis and coagulation of blood, Anti-clotting mechanism and anticoagulants

UNIT-II

Respiratory Aspect:

1. **The basics of Ventilation:** Pulmonary anatomy, Mechanics of ventilation, Static and dynamic lung volumes, Dead space and alveolar ventilation, Minute Ventilation, Acute and chronic responses to exercise

3. **Control and regulation of ventilation** Neural-humoral mechanisms Central inputs to the inspiratory centre Central Command from the motor cortex Humoral & Peripheral input

4. Acute responses to exercise from rest to maximal Chronic effects of endurance training

5. How age, gender, and race affect pulmonary ventilation during exercise

6. Gas exchange, oxygen consumption from rest to maximal exercise

Unit – III

Skeletal & Neuromuscular and Endocrine System

1. Skeletal muscle structure and contractile properties, Types of skeletal muscle and how they are important in various sports activities, Architectural properties

Neurons, motor unit recruitment and integrative control of movements, Neurological Control of Movement, Neuromuscular Adaptations to Resistance Training, Size principle of motor unit recruitment, Contractile properties, Types of contractions experimental models of muscle contraction, Length-tension relationship, Force-velocity relationship

2. Training for muscle strength, endurance, and power, Principles of skeletal muscle adaptations Principles of endurance conditioning, Central and neuromuscular fatigue, Ergogenic aids that enhance muscle size and function, Muscle glycogen; super-compensation during / before athletic competition.

3. The tissues of the human skeletal system, Joints Adaptive abilities and capacity of the skeletal system to exercise

4. Acute effects of exercise training on hormone levels and hormone activity, Control and regulation mechanisms involved in hormone homeostasis during exercise, Chronic effects of exercise training on hormone levels, especially the elite athlete, Measurement of blood pressure, sweat rate during exercise

5. Acute and chronic effects of exercise training on immunity and immune responses, Age and gender differences in immune responses, Strength training in distance runners: Impact on Running Economy

6. Hormones responsible for the anabolic and catabolic effects of exercise on muscle

Unit-IV

Applied Exercise Physiology

1. **Bioenergetics:** Human energy metabolism during exercise, Human energy systems and fatigue during exercise.

2. Training for aerobic and anaerobic power, Training principles, Anaerobic/ aerobic changes with training, Factors affecting training response, Exercising during pregnancy

3. Muscular strength, Strength and Resistance training, Structural and functional adaptations to resistance training, Body composition and physical performance, Measurements of heart rate at rest and different exercising conditions, Classification of workload & continuous recording of heart rate using heart rate monitor, Determination of maximal heart rate, cardiac cost & cardiac efficiency-step test, cycle ergometer & treadmill

Measurement of body temperature, (oral, axial, skin) at rest and different working

Condition, Recording and interpretation of ECG & EMG at rest and working condition; effects of posture on ECG, Determination of pulmonary ventilation; Static and dynamic lung function tests

4. Exercise performance and Environmental Stress, Exercising at Medium And High Altitude Thermal stress (thermoregulation) during Exercise

Practical:

- To measure the normal Blood Pressure and its postural effect and exercise effect
- To determine the pulse rate on human body
- To evaluate the cardiac efficiency test on sports person/ normal healthy adults
- To assess the autonomic system of normal healthy adults

REFERENCES:

Textbooks

1. ACSM's *Guidelines for Exercise Testing and Prescription*, 8th ed., Lippincott Williams & Wilkins, Philadelphia, 2009.
2. Wilmore, J., Costill, D., and Kenney, W. *Physiology of Sport and Exercise*, 4th ed., Human Kinetics, 2008.
3. Brooks, G., Fahey, T., and Baldwin, K. *Exercise Physiology: Human Bioenergetics and Its Applications*, 4th ed. McGraw Hill
4. McArdle, W, Katch, F., and Katch, V. *Exercise Physiology: Energy, Nutrition, and Human Performance*, Lippincott Williams & Wilkins.
5. Astrand, P, et al. *Textbook of Work Physiology*, 4th ed., Human Kinetics, 2003.
6. Williams, *Nutrition for Health, Fitness and Sport*, 7th ed. Mc Graw Hill

Peer-reviewed journals

Strength and Conditioning Journal
Journal of Strength and Conditioning Research
Medicine and Science in Sports and Exercise
American Journal of Physiology

Online resources

www.acsm.org/
www.nscs-lift.org/
www.the-aps.org/
www.faseb.org

M.Sc. - Sports Physiology (Semester-I)

(Under Credit Based Continuous Evaluation Grading System)

SPH-512 (C): KINESIOLOGY & BIOMECHANICS

UNIT- I

Introduction to Kinematics

- a) Definition, aims, objectives and role of Kinesiology in sports physiotherapy.
- b) Review of fundamental concepts (applied aspect), Centre of gravity, Line of gravity, Planes, Lever system in Body, Fundamental starting positions.
- c) Review of linear and angular kinematics

UNIT- II

Mechanics of Musculoskeletal System

- a) Tissue loads, response of tissues to forces- Stress, Strain, Stiffness and mechanical strength, visco elasticity
- b) Physical Properties of bone, cartilage, tendon and ligaments, functional adaptation under pathological conditions.
- c) Impaired neuromuscular control, muscular force regulation in Framework and joints of the body: Influence of trauma and classification of the muscles, Relation of structure, functions, role of muscles, types of Muscle, contractions (Static, Concentric and Eccentric), Two joint Muscles, Angle of pull, Role of Gravity affecting muscular action.

UNIT- III

I. Introduction

- a) Nature and importance of Biomechanics in Physiotherapy
- b) Principle of Biomechanics

II. Movement Analysis

- a) Biomechanics of shoulder and shoulder complex, elbow complex, wrist and hand complex
- b) Biomechanics of pelvic, hip, knee, ankle & foot complex
- c) Biomechanics of spine

UNIT- IV

Movement Analysis

- a) Neuro biomechanics
- b) Posture and Gait analysis
- c) Biomechanical Analysis & Techniques – Force platforms

References:

1. Brunnstrom – Clinical Kinesiology, F.A. Davis.
2. Luttgens K., Hamilton N.: Kinesiology – Scientific Basis of Human Motion 9th Edi, 1997, Brown & Benchmark.
3. Rasch and Burk: Kinesiology and Applied Anatomy, Lee and Fabiger.
4. White and Punjabi – Biomechanics of Spine – Lippincott.
5. Kapandji: Physiology of Joints Vol. I, II & III, W.B. Saunders.
1. Mishra: Clinical Neurophysiology, B.I. Churchill Livingstone.

M.Sc. - Sports Physiology (Semester-I)

(Under Credit Based Continuous Evaluation Grading System)

SPH-513 (C): RESEARCH & EDUCATIONAL METHODOLOGY

UNIT – I

1. Basic concepts-Importance of research in clinical practice, Problem identification, Ethical issues in research, Literature review, meta-analysis

2. Types of Research-Qualitative & Quantitative, Descriptive & Experimental, Longitudinal & Cross-sectional, Survey Research.

3. Sample Designs-Types of sampling, Reliability, Validity, Variables, sample size.

UNIT – II

1. Processing and analysis of data-Central tendency, Dispersion, Correlation, regression analysis, multiple correlation and regression.

2. Sampling and testing of hypothesis-Concept of probability, Standard deviation, confidence intervals, null and alternate hypothesis, level of significance, correlation coefficients, ANOVA, Tukey's HSD.

3. Nonparametric Tests-Fisher Irwin test, Mc Nemar test, Wilcoxon Mali test, Mann Whitney test, Kruskal Wallis test, Spearman's rank correlation.

UNIT – III

1. Define-Symposia, Seminar, Conference, Journal, Thesis, Book, Key elements of scientific writing.

2. Presenting Research-Strategies of paper writing, Design of paper writing, Tactics of paper writing, Reasons for rejection, where to publish, Poster presentation (Poster space, Standard format), Plagiarism.

3. Oral Presentations at Conferences/Seminars-Preparing presentation, Duration of presentation, what to present

UNIT – IV

Educational Methodology-Principles and methods of teaching with respect to physiotherapy students and client: Strategies and planning of teaching, curriculum development, formation of course objective, time management, role of Audio – visual aids, method of knowledge dissemination.

Practicals:

The student will be required to review the literature thoroughly and prepare a research proposal

for dissertation in consultation with his/her supervisor by the end of the semester.

References:

1. Mohsin S.M.: Research Methods in Behavioural Sciences: Orient Publications.
2. Colton: Statistics in medicine, Little Brown Company, Boston.
3. Mahajan: Methods in Biostatistics, Jay Pee Brothers.
4. Vincent: Statistics in Kinesiology, Human Kinetics.
5. Hicks: Research for Physiotherapists, Churchill Livingstone

(Semester-II)
M.Sc. - Sports Physiology
(Under Credit Based Continuous Evaluation Grading System)
SPH-521 (C): CARDIO-RESPIRATORY PHYSIOLOGY

Unit – I

Cardiorespiratory fitness (CRF), PER-Q, resting and exercise measurement, field test for estimating CRF, PACER, walk test, graded exercise test, RPE, VO₂max, Estimating VO₂max from different response, treadmill and ergometer protocols.

Unit – II

Normal heart electrophysiology

Anatomy of the heart

Location of heart in chest cavity

Blood vessels that supply the heart

Blood flow through the heart

Electrophysiology of the heart

Normal electrical pathway

Electrical-mechanical association

Relationship among electrical conduction, blood flow through the heart, pressures inside the heart, and mechanical contraction

1. EKG equipment and placement of electrodes in

12-lead Goldberger's three basic laws of

electrophysiology Einthoven's triangle

Leads: I, II, III, AVR, AVF, AVL, V1 – V6

One cardiac cycle EKG waveforms, segments, and intervals, and their representation of electrical conduction; Resting 12-lead electrocardiogram normal limits

The difference between resting and exercise EKG electrodes used

2. Electrocardiogram interpretation steps

Normal limits of waveforms, segments, and intervals and what it means to be out of the normal limit

3. Normal sinus rhythm

Sinus Bradycardia

Sinus Tachycardia

Normal EKG changes during exercise testing

What is tach act? What are the major categories of tach act? What do they look like? When do they occur?

Unit – III

Abnormal heart electrophysiology

Ectopic foci

Inherent rates of sinus, atrial, junctional, and ventricular rhythms

Premature beats: PAC, PJC, PVC Escape beats

Exercise restrictions

2. Supraventricular rhythms

Sinus arrhythmias

Rhythms originating from ectopic foci: atrial, junctional, ventricular

Exercise restrictions

3. AV heart blocks

1st degree

2nd degree – two types

3rd degree

Exercise restrictions

4. Bundle Branch Block

Right and Left

Hemiblocks

Exercise restrictions

5. Wolfe-Parkinson-White (WPW) Syndrome

LGL Syndrome

Exercise restrictions

Unit – IV

Other electrophysiology considerations

1. Criteria for determining ischemia, injury, and infarction

2. Determination of Axis

Quadrants: Normal, LAD, RAD, and extreme RAD

Degrees

Rotation—transition zone

Pacemaker rhythms

External and implantable

Pacemaker codes

Exercise restrictions

Monitoring leads

Electrode placement

Practical:

- To measure the cardiovascular and respiratory aspect on patients
- Demonstration of different VO₂ (oxygen consumption) protocols on different platform
- Demonstration of ECG and its interpretation
- Demonstration of team performance physiological variables instrument.

References

Textbooks

1. Booth, et al. *Electrocardiography for Health Care Personnel*, 2nd ed., McGraw-Hill, 2008.
2. De Luna. *Clinical Electrocardiography: At Textbook*, 2nd ed., Futura Publishing Company, 1998. 12
3. Wagner, G. *Marriott's Practical Electrocardiography*, 11th ed., Liippincott Williams & Wilkins, 2007.

Peer-reviewed journals

Annals of noninvasive electrocardiology : the official journal of the International Society for Holter and Noninvasive Electrocardiology, Inc. *Journal of electrocardiology*

Online resources

www.ecglibrary.com/

library.med.utah.edu/kw/ecg/

www.12leadecg.com/full/

M.Sc. - Sports Physiology

(Under Credit Based Continuous Evaluation Grading System)

SPH-522 (C): Exercise and Environmental Physiology

Unit-I

Concept of altitude and atmospheric pressure, different types of performance, maximal O₂ consumption at altitude, cardiovascular and respiratory changes at altitude, acclimatization at altitude, training at altitude.

Unit-II

Effect of cold exposure, wind chill factor, insulating factors, heat production and factors affecting cold, coping with hypothermia, concept of air pollution and different variables of air pollution.

Unit-III

Concepts of underwater physiology and its application in exercise science, zero gravity physiology and its implication on exercise physiology.

Unit-IV

Overview of heat balance during exercise, temperature measurement during exercise, overview of heat production and heat loss, heat storage in body during exercise, body's thermostat, thermal events during exercise, Heat index, exercise in a hot environment, sweat rate during exercise, performance changes, exercise related heat injuries, prevention of dehydration during exercise, heat acclimatization, measurement of relative humidity and WBGT index.

References

Textbooks

1. ACSM's *Guidelines for Exercise Testing and Prescription*, 8th ed., Lippincott Williams & Wilkins, Philadelphia, 2009.
2. Wilmore, J., Costill, D., and Kenney, W. *Physiology of Sport and Exercise*, 4th ed., Human Kinetics, 2008
3. McArdle, W, Katch, F., and Katch, V. *Exercise Physiology: Energy, Nutrition, and Human Performance*, Lippincott Williams & Wilkins

M.Sc. - Sports Physiology

(Under Credit Based Continuous Evaluation Grading System)

SPH-523 (C): KINANTHROPOMETRY AND EXERCISE PHYSIOLOGY

Unit – I

Introduction to Kinanthropometry, history, Human body composition, and its measurement techniques, Somatotyping and its measurement techniques, concept of growth, maturation and performance, physical activity and flexibility assessment theoretical basis.

Unit-II

Training principles: overload, specificity, reversibility
Components of a training session, warm up, work out and cool down
Training to improve aerobic power

Unit-III

Injuries and endurance training, training to improve anaerobic power, training to improve muscular strength, Concurrent of strength and endurance training programs, nutritional influence on training induced skeletal muscle adaptation.

Unit-IV

Muscle soreness, training to improve flexibility, year-round conditioning for athletes, common training mistakes.

Practical:

Body composition related fat% measurement by different methods
Somatotyping related measurement by Heath-Carter method and computational method
Physical activity, flexibility and energy expenditure measurement

References

Textbooks:

1. KINANTHROPOMETRY AND EXERCISE PHYSIOLOGY LABORATORY MANUAL Tests, procedures and data Third Edition Volume One: Anthropometry
 2. KINANTHROPOMETRY AND EXERCISE PHYSIOLOGY LABORATORY MANUAL Tests, procedures and data Third Edition Volume Two: Physiology
- Exercise Physiology: Theory and Application to Fitness and Performance, Scott K Powers et al.

M.Sc. - Sports Physiology

(Under Credit Based Continuous Evaluation Grading System)

**SPH-526 (E): EVIDENCE BASED PRACTICE IN ALLIED HEALTH SCIENCES
(ELECTIVE)**

Unit-I

- 1. Introduction to evidence- based complementary medicine**
- 2. Evidence-based health care**
- 3. Evidence-based practices**
- 4. Evidence-based decision making and management**

Unit – II

Types of evidence

- a. Definition of evidence**
- b. Forms of evidence**
- c. Randomized controlled trials**

Unit – III

- a. Case-control studies**
- b. Cohort studies**

Unit – IV

- 1. Applying the evidence**
 - a. Pathways, guidelines and protocols**
 - b. Future directions for clinical effectiveness**
- 2. Evaluation of effectiveness and efficiency of the process**

References:

1. Martin Dawes, Philip Davies, and Alistair Gray, Evidence-Based Practice: A Primer for Health Care Professionals. Elsevier Publication.
2. Albert R. Roberts and Kenneth R. Yeager, Evidence-Based Practice Manual: Research and Outcome Measures in Health and Human Services, Oxford University Press.
3. Allen Rubin, Practitioner's Guide to Using Research for Evidence-Based Practice. John Willey & Sons Publication.
4. Domhnall MacAuleyThomas M Best, Evidence-based Sports Medicine. BMJ Books.
5. Kathryn Refshauge and Elizabeth Gass, Musculoskeletal Physiotherapy: Its Clinical Science and Evidence-Based Practice. Churchill Livingstone.
6. Allen Rubin, Statistics for Evidence-Based Practice and Evaluation. Cengage Learning

M.Sc. - Sports Physiology

(Under Credit Based Continuous Evaluation Grading System)

SPH-527 (E): WOMEN HEALTH AND EXERCISE (ELECTIVE)

UNIT-I

- 1. Gender difference in muscle morphology**
- 2. Diagnosis and Treatment of Urinary Incontinence and Prolapse**
- 3. Anaemia**

UNIT-II

- 1. Hypertension in Women**
- 2. Bone health: assessment and treatment of osteopenia and osteoporosis**
- 3. Evaluation and Treatment of Common Musculoskeletal Complaints**

UNIT-III

- 1. Exercise for the childbearing year**
- 2. Exercise for adolescence**
- 3. Perimenopausal and post menopausal**

UNIT-IV

- 1. Exercise in Athletic Women**
- 2. Medical Problems in Sports Women**

References:

1. Nadya Swedan (2001): Women's Sports Medicine and Rehabilitation. An Aspen Publication.
2. Mary Lloyd Ireland & Aurelia Nattiv (2002): The Female Athlete. Saunders Publication.
3. Cardozo L and Staskin D (2006): Textbook of Female Urology and Urogynaecology (2nd edn). London: Isis Medical Media Ltd.
4. Mantle J, Haslam J and Barton S (2004): Physiotherapy in Obstetrics and Gynaecology. (2nd ed.) London: Butterworth-Heinemann.
5. Sapsford R, Markwell S and Bullock-Saxton J (1998): Women's Health: A Textbook for Physiotherapists. London: WB Saunders Company Ltd.
6. Bo, K., Berghmans, L.C.M., Van Kampen, M., Morkved, S. (2007). Evidence-Based Physical Therapy for the Pelvic Floor: Bridging Science and Clinical Practice. London: Churchill Livingstone.

(Semester-III)
M.Sc. - Sports Physiology
(Under Credit Based Continuous Evaluation Grading System)

SPH-531 (C): EXERCISE AND FITNESS- HEALTH AND SKILL-RELATED
COMPONENTS

Unit – I

Pre-test considerations

1. Benefits associated with physical activity
2. Physical activity and fitness terminology
3. Benefits of regular physical activity
4. Exercise dose response relationship
2. Risks associated with physical activity
 1. Sudden death among young individuals and athletes
 2. Exercise events in those with sickle cell trait
 3. Exercise-related cardiac events in adults
 4. Safety considerations
3. Pre-participation screening algorithm
 1. Risk stratification and medical clearance
 2. Pre-exercise test evaluations
 3. Baseline measurements
 4. Calculation of HR MAX and 85% HR max depending on protocol
 5. Population considerations; Children, elderly, apparently healthy, etc.
4. Test Order
 1. Equations used to estimate aerobic power from TM protocols
 2. Cycle ergometer protocols (arm and leg)
 3. Equations used to estimate aerobic power from cycle ergometer protocols
 4. ACSM guidelines for when to stop a test
 5. Calculations used to estimate aerobic power from other variables

Unit – II

Test protocols used for measuring the health- and skill-related components of fitness

1. CV endurance field tests VO₂max testing Norm tables
1. Maximal vs submaximal tests
2. Muscular strength, endurance, and flexibility
3. Balance, agility, coordination, reaction time, and anaerobic power

Unit – III

Exercise testing modifications for cardiac patients

1. Medical clearance
2. Physician approval for testing Risk factor identification
3. Medical emergency equipment
4. Risks of cardiac events during exercise testing
5. Diagnostic exercise testing Exercise testing for disease severity and prognosis
Functional exercise
6. testing
7. Measurements during exercise testing Exercise testing after an MI

UNIT-IV

Risk stratification for cardiac patient Inpatient rehabilitation programs Outpatient exercise programs Recommendations for supervision and monitoring of exercise

Signs and symptoms below which an upper limit for exercise intensity should be set FITT principle and progression of exercise for the cardiac patient

Benefits of endurance exercise training in cardiac patients Benefits of resistance training for cardiac patients Risks of cardiac events during cardiac rehabilitation Prevention of exerciserelated

cardiac events Exercise training for return to work

Practical:

- Demonstration of Kinematic measurement system and its data collection and report analysis
- Demonstration of strength and power analysis instrument and its data export and related analysis.
- Demonstration of Dynamic force platform and its data collection and interpretation

References

Textbooks

1. Heyward, Vivian. *Advanced Fitness Assessment and Exercise Prescription*, 5th ed., Human Kinetics, 2006.
2. ACSM's *Guidelines for Exercise Testing and Prescription*, 8th ed., Lippincott Williams and Wilkins, 2009.
3. Ed. Durstine and Moore. *ACSM's Exercise Management for Persons with Chronic Diseases and Disabilities*, 2nd ed. Human Kinetics, 2003
4. ACSM's Health-Related Physical Fitness Assessment Manual, 3rd ed, 2009.

Peer-reviewed journals

Strength and Conditioning Journal

Journal of Strength and Conditioning Research

Medicine and Science in Sports and Exercise

Online resources

www.acsm.org/

www.nscs-lift.org/

M.Sc. - Sports Physiology (Semester-III)

(Under Credit Based Continuous Evaluation Grading System)

SPH-532 (C): EXERCISE AND SPORTS NUTRITION

Unit – I

Nutrition Basics

What Nourishes You?

The Basis of a Healthy Diet, The food pyramids, Energy density of macronutrients and Human Digestion and Absorption Metabolism of the energy-yielding nutrients

Bioenergetics: fuels for exercise and their pathways Anaerobic metabolism, ATP-CP,

Myokinase, fast glycolysis, lactic acid production Fate of lactic acid, Aerobic metabolism,

Transition into the mitochondria, Krebs' cycle, ETC Macronutrients: when are they used

for fuel for exercise? Carbohydrates, Lipids, Proteins

Unit-II

Research related to pre-competition and post-competition meals

1. Timing, Content of pre-competition and post-competition meals

2. Glucose and insulin responses of pre-competition meals

3. Glycogen loading (supercompensation)

4. Different needs for specific sports activities

5. The importance of recovery; optimal amount of recovery time according to training/competition

Unit – III

Research related to dietary supplements and their effects on performance

1. Vitamins and minerals

2. Creatine phosphate; creatine monohydrate; other creatine supplements

3. Sodium bicarb and other buffering agents

4. Ginseng

5. Caffeine

6. Over the counter drugs: i.e., amphetamines

7. Prescribed drugs: i.e., beta blockers

8. Nutritional disorders: Anorexia Nervosa Bulimia Nervosa Binge-Eating Disorder,

Other Conditions Metabolic Syndrome, Female Athlete Triad. The ethics of weight control in some sports

Unit – IV

1. Illegal substances, Ergogenic aids

2. Substances banned by athletic organizations and the IOC: Position Stands

3. Blood Doping.

4. Drug Testing.

5. Ethics and Philosophy of Drug Testing

Seminars and Group Discussion: It will be mandatory for students to conduct seminars on the latest trends in Sports Nutrition.

References

Textbooks

1. Ed. Burke & Deakin. *Clinical Sports Nutrition*, 3rd

ed., McGraw-Hill

2. Burke, *Practical Sports Nutrition*, Human Kinetics, 2007.

3. Ed. Gibney, et al. *Introduction to Human Nutrition*, Blackwell, 2002.
4. Groff & Gropper. *Advanced Nutrition and Human Metabolism*, 3rd ed., Wadsworth, 2000.
5. Jeukendrup & Gleeson. *Sport Nutrition*, Human Kinetics, 2004.
6. Antia F.P. 'Clinical Dietetics and Nutrition'. III Edition. Oxford University Press. Bombay, 1989. Modern Nutrition in Health and Disease. Shils, M.E. and Young V.R. Bombay K.M. Varghese Company (vi edition 1988)
7. Passmore, P. and M.A. Eastwook. (1986). *Human Nutrition and Dietetics*. ELBS, Churchill, Livingstone, 8th Edition Shils, M.E. and Young V.R. (1988). *Modern Nutrition in Health and Disease*.
6. Bombay K.M. Varghese Company (VI edition) Mahan, L.K. & Ecott-Stump, S. (2000). *Krause's Food, Nutrition and Diet*
7. *Therapy*, 10th Edition, W.B. Saunders Pvt. Ltd.

Peer-reviewed journals

Journal of the International Society of Sports Nutrition

Journal of Sports Nutrition

The Journal of Nutrition

The American Journal of Clinical Nutrition

European Journal of Clinical Nutrition

British Journal of Nutrition

Online resources

www.sportsnutrition.society.org

http://www.ausport.gov.au/ais/nutrition/publications/current_concepts

www.sportsnutritionguide.net

(Semester-III)

M.Sc. - Sports Physiology

(Under Credit Based Continuous Evaluation Grading System)

SPH-533 (C): NEURO MUSCULOSKELETAL SYSTEM IN EXERCISE & TRAINING

Unit-I

Muscle fibre types and their influence in different kind of sports, training effects on muscle development, muscle properties with changing training load, neuro muscular rehabilitation with

training.

Unit-II

Training types and definition and their relation with exercise development, training to improve

aerobic and anaerobic strength, Concurrent strength and endurance training program

Unit-III

Laboratory assessment of muscular aspect and training aspect, muscle adaptation to aerobic and

anaerobic exercise training, resistant training and training induced increase in strength.

Unit-IV

Immunologic and molecular changes during exercise and strength training, overtraining and detraining and their effects on physiological system.

Practical:

- Demonstration of eye tracking data collection and its interpretation
- Demonstration of EEG its data collection and interpretation
- Demonstration of CANTAB data collection and report interpretation
- Demonstration of other psychological training and its implementation on sports science

Semester-IV)

M.Sc. - Sports Physiology

(Under Credit Based Continuous Evaluation Grading System)

SPH-541 (C): APPLIED EXERCISE PHYSIOLOGY

Unit-I

Epidemiology and pathophysiology of stroke, functional consequences of stroke, acute responses

to exercise, exercise testing and screening criteria, prescription and programming, education and

counselling

Unit-II

Epidemiology and pathophysiology of muscular dystrophy, spinal cord injury and brain injury

patients, focus of rehabilitation by exercise, muscle strength and flexibility development, guidelines for implementing an exercise program.

Unit-III

Osteoarthritis, rheumatoid arthritis and their physical examination, exercise testing and prescription, resistance exercise, counselling and education, exercise and activity for nonspecific

back pain personals, exercise for acute and chronic low back pain.

Unit-IV

Osteoporosis and its physical examination, exercise, fitness and functional testing, prescription

and educational program, amputation and its exercise testing, prescription and programming, exercise immunology and its function under environmental stress, immunity changes after different bouts of exercise

Practical

Demonstrating functional outcomes of medical history review and physical examination

Understanding informed consent and ethical concerns

Demonstration of HRV data collection and its interpretation

Demonstration of Skin conductance and its data collection and interpretation

Demonstration of Spirometry data collection and report interpretation

Demonstration of biochemical analysis (biomarkers) related to sports performance

Demonstration of EMG, Wingate, Kinematic, Kinetic and team specific physiological monitoring.

References

Textbooks

ACSM's Resources for Clinical Exercise Physiology 2nd Edition

M.Sc. - Sports Physiology (Semester-IV)

(Under Credit Based Continuous Evaluation Grading System)

SPH-542 (C): METHODS OF EXERCISE PRESCRIPTION

Unit – I

General principles of exercise prescription

1. Legal issues regarding

Waiver, informed

consent,

PAR Q

medical clearance needed?

baseline measurements taken before exercise tests

2. Importance of warm up and cool down instructions in an exercise prescription

3. The FITT principle and rate of progression

Principles of training

UNIT-II

4. Methods of prescribing intensity of endurance exercise

VO₂

VO₂ reserve

HR

HR reserve

Rating of perceived exertion

Symptom-limited

Energy expenditure

Unit – III

Clinical conditions influencing exercise prescription

1. Arthritis

Osteoporosis

Hypertension

2. Obesity

Metabolic disorders

Metabolic syndrome

3 Immunological diseases

Exercise and upper respiratory tract infections

4 Peripheral arterial disease

Pulmonary diseases

Unit – IV

Other special conditions in the healthy population

1 Pregnancy

2 Elderly

3. Children

4. Physically handicapped

Practical:

Measurement of Physical fitness using field tests

a) AAHPERD test battery

b) BROCKPORT test system

c) Static and dynamic balance measurement

d) Blood oxygenation assessment through fNIRS System

e) Clinical assessment of Knee laxicity

References:

Textbooks

ACSM's Guidelines for Exercise Testing and Prescription, 8

th

ed., Lippincott, Williams, &

Wilkins, 2009.

Skinner, J., *Exercise Testing and Exercise Prescription for Special Cases—theoretical basis and clinical application*. 3

rd

ed., Lippincott Williams & Wilkins, 2005.

Peer-reviewed journals

ACSM's Health & Fitness Journal

Online resources

www.acsm.org/

www.nscs-lift.org/

Other

American College of Sports Medicine Position Stand: appropriate physical activity intervention

strategies for weight loss and prevention of weight regain for adults, *Medicine and Science in sports & Exercise*, Feb, 2009.

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SPH-545 (E): SPORTS PSYCHOLOGY AND PHYSIOLOGICAL ASPECT (ELECTIVE)

Unit – I

1. History and current status of Sports Psychology.

2. Personality Assessment and sports personality.

a. Theories of personality

b. Personality assessment

3. Attention and perception in sports.

a. Attention

b. Perception

4. Concentration training in sports.

a. Basic principles of concentration

b. Concentration training

c. Concentration awareness exercises

5. Motivational orientation in sports.

a. Athlete's needs of motivation

b. Motivational inhibitors

c. Motivational techniques

Unit – II

1. 1. Pre-competitive anxiety.

a. Source of PCA

b. Effect of PCA on performance

2. Relaxation Training.

a. Definition

b. Types of relaxation trainings

i) Progressive muscle relaxation

ii) Breathing exercises

iii) Yognidra

iv) Transcendental meditation

3. Aggression in sports.

a. Theories of aggression

b. Management of aggression

4. Role of Psychology in Dealing with injuries.

5. Eating disorders.

a. Etiology of eating disorders

b. Types of eating disorders

c. Complications of eating disorders

6. Goal setting

Unit – III

1. Psychological aspect of doping

2. Psychological preparation of elite athletes

a. Concept of psychological preparation

3. Biofeedback training

4. Mental imagery

5. Stress management

a. Principles of Stress Management

b. Stress Management techniques

UNIT-IV

6. Group Behaviour and leadership

a. Nature of group behaviour and group. b. Types of group.

c. Educational implication of group behaviour.

d. Meaning of leadership, types of leadership quality of leadership, training and functioning of leadership.

7. Emotion

a. Meaning of emotion.

b. Characteristics of emotion.

c. Meaning of controlling and training of emotions and its importance.

d. Contribution of sports to emotional health.

e. Meaning of sentiment, its type, importance and formation.

References:

1. Morgan and King: Introduction to Psychology - Tata McGraw Hill.
2. Suinn: Psychology in Sports: Methods and applications, Surjeet Publications.
3. Grafiti: Psychology in contemporary sports, Prentice Hall.
4. Basmajian: Biofeedback Sanjiv P. Sahni: Handbook of Sports Psychology – A comprehensive manual of Mental Training