UNIVERSITY OF CALCUTTA

Notification No. CSR/ 85 /18

It is notified for information of all concerned that the Syndicate in its meeting held on 13.07.2018 (vide Item No.11) approved the Regulations and Syllabi of the following Two-Year (Four-Semester) Courses :

(i) M.Sc. in Sports Biochemistry,

(ii) M.Sc. in Sports Nutrition, and,

(iii) M.Sc. in Sports Physiology

under CBCS imparted in the Department of Sports Sciences of this University and in the affiliated Colleges offering Post-Graduate Courses under this University, as laid down in the accompanying pamphlet.

The above shall be effective from the academic session 2018-2019.

SENATE HOUSE
KOLKATA-700073
The 31st August, 2018

(Debabrata Manna)
Deputy Registrar (Acting)

Department of Sports Sciences
University of Calcutta

M.Sc. in

Sports Physiology

SYLLABUS
&
REGULATIONS

2018

CONTENT

**** The course will follow the regulation frame published by the University time to time.***

ORIENTATION OF COURSES: FOUR SEMESTERS (2 years) FOR M. Sc. IN SPORTS PHYSIOLOGY

Subject Code	Theory/ Practical/Project	Subject	Marks	Credit
1st SEMESTER *(CORE COURSES)*				
SE CC11-(TH)-P01	Theory	Fundamentals of Exercise Physiology & Principles of Sports Training	50	4
SE CC12-(TH)-P02	Theory	Basic System Physiology in Sports & Exercise, Exercise Immunology, Sports Genetics	50	4
SE CC13-(TH)-P03	Theory	Applied Sports Physiology & Physiological Support of Athletes	50	4
SE CC14-(PR)-P04	Practical	Fundamentals of Exercise Physiology & Principles of Sports Training	50	4
SE CC15-(PR)-P05	Practical	Applied Sports Physiology	50	4
		Total	250	20
2nd SEMESTER*(CORE COURSES)*				
SE CC21-(TH)-P06	Theory	Environmental exercise physiology	50	4
SE CC22-(TH)-P07	Theory	Biomedical Instrumentation	50	4
SE CC23-(TH)-P08	Theory	Research Methodology & Statistical Methods in Sports	50	4
SE CC24-(PR)-P09	Practical	Environmental exercise physiology	50	4
SE CC25-(PR)-P10	Practical	Statistical Methods in Sports& Computer Applications	50	4
Total			250	20
Summer project: Student will opt their DSEC for their 4th Semester curriculum based on merit and will be assigned for summer projects.Students will present summer project in 4th Semester under DSEC curriculum.				
3rd SEMESTER*(CORE COURSES &GENERIC ELECTIVE COURSES)*				
SE CC31-(TH)-P11	Theory	Sports Biomechanics	50	4
SE CC32-(TH)-P12	Theory	Kinesiology and Motor Learning	50	4
SE CC33-(PR)-P13	Practical	Sports Biomechanics and Kinesiology	50	4
SE GEC31-(TH)-P14	Theory	CBCC-X or other codes Students will opt subjects offered by other Departments	50	4

SE GEC32-(TH)-P15	Theory	CBCC-Y or other codes Students will opt subjects offered by other Departments	50	4
Total			250	20
4th SEMESTER*(CORE COURSES &DISCIPLINE SPECIFIC ELECTIVE COURSES)*				
SE CC41-(TH)-P16	Theory	Clinical exercise physiology	50	4
SE DSEC41-(TH)-P17	Theory	Students will opt subjects offered by the Department	50	4
SE DSEC42-(TH)-P18	Theory	Students will opt subjects offered by the Department	50	4
SE DSEC43-(PR)-P19	Practical	Students will opt subjects offered by the Department	50	4
SE DSEC44-(PS)-P20	Project	Students will opt subjects offered by the Departments (a) **P**roject work & **S**eminar; (b) **V**iva	50	4
Total			250	20
"P" stands for paper		**Grand Total**	**1000**	**80**

DSE Courses: Department will offer following courses for students of "Sports Physiology".

1. **Yoga in Sports**
2. **Exercise physiology and Gender**

GE Course: Department will offer following course for students of other Departments.

"Science in Sports Performances"

Detailed Syllabus for Two-year M. Sc. Course in Sports Physiology
University of Calcutta - 2018

First Semester

SE CC11-(TH)-P01: FUNDAMENTALS OF EXERCISE PHYSIOLOGY & PRINCIPLES OF SPORTS TRAINING

Learning objectives	To learn the changes in human body systems due to exercise and sporting activities in an integrated manner. To gain knowledge about spots training
Learning outcome	Students will be ready to study effect of exercise in detail and in application perspective. Students will be able to measure the changes and interpret them in the context of sports
Unit 1	Origins of Exercise Physiology; Scope, Importance; Application in Competitive sports, Recreation sports, Medical rehabilitation; Human energy transfer in rest and exercise; Concept of Aerobic and anaerobic energy production; Energy expenditure in different activities;
Unit 2	Physiological Adaptations to exercise and training; measurement of exercise and training related changes
Unit 3	History, Importance, Aim and objectives of sports training; Characteristics of sports training; biological process in training; Components of physical fitness (motor abilities)– endurance, strength, speed, flexibility, co-ordination; agility Principles of training - Overload, specificity, progression and reversibility; Meaning and concept of Training load; Adaptation and Recovery, supercompensation, training structure - volume, intensity, frequency; Peaking,errors in training

Unit 4	Training plan; Need and importance in planning; Types of training plans - short term and long term plans; Training and competition cycles (training conception, macro, micro, meso); Periodzation – Need, Types; Aims of various phases of Periodzation (Preparatory, competition and transition); Competition -Types of Competition Preparation for competition; the number and frequency of competition. Training athletes with disability. Adapted games for Disabled; Special Olympics and Paralympics
Unit 5	Test, measurement and evaluation of performance, Test battery - AAHPERD tests, BROCKPORT test system, The Canadian Assessment of Physical Literacy tests, and other tests. Organizational aspects of sports; Olympic movement; Sports and games in Olympics, Asian Games, and other major international competitions; General structure of Rules and Regulations of different sports/games

SE CC12-(TH)-P02: BASIC SYSTEM PHYSIOLOGY IN SPORTS AND EXERCISE, EXERCISE IMMUNOLOGY, SPORTS GENETICS

Basic System Physiology in Sports and Exercise

Learning objectives	Understanding the basic system physiology in sports
Learning outcome	Capable of application of system concepts behind sports performance.

Introduction: Human Physiology; Cells, Tissues, Organs and System Organization; Cell structure; Transport through Cell Membrane; Classification of Tissue; Homoeostasis; Role of organ and its system in regulation of homeostasis; Factors alteringhomeostasis.
Nervous System: Classification of nervous system (Central and peripheral); Structure and Function of neuron; ion channels; Role of action potential in neuro transmission; Neurotransmitters and drug abuse.
Muscular System: Structure and Types of muscles; Anatomy of muscle fibre; Muscle contraction; Muscle fibres; types and characteristics of muscle fibres including metabolism; Remodelling of muscle fibres for strength and conditioning; Muscle hypertrophy and atrophy; Muscle tone and fatigue.
Respiratory system: Anatomy of respiratory system; Upper and lower respiratory tract; External, Internal and Cellular respiration; Pulmonary ventilation; Principles of gaseous

exchange – diffusion of oxygen and carbon-di-oxide from respiratory membrane; Transport of oxygen and carbon-di-oxide in the blood and body fluids.**Regulation of respiration:** Chemical control; Peripheral chemo receptors in the regulation of respiration.

Cardiovascular System: Anatomy of heart and blood vessels; Conduction system in heart; Normal electrocardiogram; Systemic, Coronary and Pulmonary circulation; Cardiac cycle; Cardiac output and BloodPressure.

Endocrine System: Different endocrine glands and their hormones; Major functions; Mode of action mechanism and regulation.

Digestive System: Organs of GI Tract and their major functions.

Excretory System: Anatomy; Function; Renal circulation; Auto regulation of the circulation; structural and functional unit; Urine formation; Body fluid compartments and its regulation; Intracellular and extracellular body compartments; Constituents of extracellular fluids and osmotic regulation; Kidney functions; Basic theory of nephron function; Renal blood flow and glomerular filtration; Renal mediated regulation of extracellular fluid osmolality and sodium concentrations; Regulation of acid base balance; Respiratory & renal mechanism; Clinical abnormalities of acid basebalance.

Immunity: Innate and Adaptive immunity; Non-specific and Specific defence mechanism; Immune response pathway like inflammation and antigen specific responses.

Reproductive System: Male reproductive system (structure and function) and Female reproductive system (structure and function, menstrual cycle and pregnancy).

Exercise Immunology

Learning objectives	1. An understanding of humeral and cellular immunity and their relative significances to transfusion science theory and practice. 2. An understanding of the characteristics of antigens and antibodies 3. An understanding of the nature of antigen-antibody reactions. 4. An appreciation of the importance of immunology as a foundation of transfusion medicine theory and practice.
Learning outcome	This course provides with knowledge and understanding of, and practical skills in, immunology and the way it is applied in diagnostic and therapeutic techniques and research.
Unit 1	Immunological system and exercise : Exercise and innate and humoral immunity, Exercise induced change in Ig and antibody, exercise and cytokines.
Unit 2	Sex Differences in Immune Function after Aerobic Exercise, Sex differences in immune variables and respiratory infection, Killer cell immunoglobulin-like receptors and exercise, Anti inflammatory influence of exercise training-Physical activity, fitness, and chronic inflammation, C-Reactive Protein (CRP),

Unit 3	Cytokines, Free radicals, Antioxidants, Effect of exercise on immunity, Physical activity – A stimulator and an inhibitor to the immune system. Exercise and upper respiratory tract infection,
Unit 4	Infection and exercise performance, Exercise and HIV infection, Exercise and Cancer, Exercise aging and immunity, Maintaining immune health, Importance of exercise immunology in health promotion.

Sports Genetics

Learning objectives	1. An understanding of the Sport and exercise genetics. 2. A working understanding of the genetic terminology required to be able to function well in the transfusion laboratory. 3. An understanding of the clinical relevance of genetics concepts. 4. An appreciation of the importance of genetics as a foundation of transfusion science theory and practice.
Learning outcome	□ Understand some of the types of disease that might be treatable by gene therapy. □ Understand the basic principles of sports genetic manipulation □ Understand how genetics may be used in the design of drugs.
Unit 1	Sport and exercise genetics : Basic concepts, Ethical concerns of conducting genetic research, Components of Performance, Heritability of subtraits, Key Performance Genes, ACE I/D, ACTN3 R577X, Genetic influences on quantitative traits and sports performance, Experimental approaches for studying genetics of sport performance;
Unit 2	The importance of making comparisons between homogeneous groups, Single gene
	approach vs. polygenic profile, Identification of new polymorphisms, Strategies to identify physiological roles of a polymorphism, Genetic interactions, Rare variants, The use of genetic markers to detect sports talent, Traditional performance tests versus genetic tests that predict performance-related variables;

Unit 3	Genetic performance tests and its consequences, Injury Risk, mild traumatic brain injury, Tendinopathy, Relevance for Young Athletes, Genetic Testing, Genetic testing for sudden cardiac death and other diseases;
Unit 4	Genetic testing for the prediction of less severe conditions, Personalized exercise medicine, Gene doping, Genetic testing and the fight against doping.

SE CC13-(TH)-P03: APPLIED SPORTS PHYSIOLOGY & PHYSIOLOGICAL SUPPORT OF ATHLETES

Applied Sports Physiology

Learning objectives	To understand the physiological adaptation and metabolic changes during exercise at varying intensities.
Learning outcome	Enables the students to gain an overall understanding of human body functioning during exercise and thus provide appropriate nutrition/fuel.
Unit 1	Physiology of Endurance Performance: Cardiovascular control during exercise, cardiovascular response to endurance exercise, Respiratory regulation during exercise, Cardiovascular and respiratory adaptation to training.
Unit 2	Physiology of Strength Performance : Types of muscle fibers, Generation of muscle force, Factors influencing force generation, Strength curve and rate of force development for various muscles , Measuring muscular performance, Muscle size, Muscle hypertrophy and hyperplasia,
Unit 3	Resistance training, Periodization of resistance training development for various muscle.
Unit 4	Physiological adaptation in response to resistance training, Delayed Onset Muscle Soreness (DOMS).

Physiological Support of Athletes

Learning objectives	To improve health care in general and the profession of athletic training in particular and that places the patient's needs at the center of their world views.
Learning outcome	Students will be able to identify injury and illness risk factors associated with participation in competitive athletics and will be able to plan and implement all components of comprehensive athletic injury and illness prevention program.
Unit 1	Concept of athlete support, Athlete development stages - child, pre-adolescent, adolescent and adult. Human growth and development. Age related development in performance. Concept of talent in sports. Talent identification.
Unit 2	Physiological testing of athletes Maximal aerobic capacity- Explanation of result, its implication in sports, Training intensity and improvement in VO_{2max} , Limitations of assessing VO_{2max}, Indirect assessment of VO_{2max}- Multi-stage shuttle run test, Cooper test, Queens College Step test. Sub-maximal aerobic test- Astrand nomogram, PWC 170.Assessment of strength- Dynamometers, 1repitition maximum (1RM). Assessment of dynamic strength; Assessment of muscular endurance; Assessment of flexibility; Assessment of anaerobic power- Mergaria power test, de Bruyn Prevost test; Wingate test-Peak power output, Relative peak power output, Anaerobic fatigue, Anaerobic capacity/power. Running based Anaerobic Sprint Test (RAST)- Maximum power, Minimum power, Fatigue index. Peak lactate and its importance- Talent selection and transfer of talent, Changes of lactate peak during season, Lactate peak and training,
Unit 3	Athlete Monitoring And Analysis, Time-motion analysis in sport; analysis of athlete tracking systems; GPS and accelerometer analysis of training and competition; monitoring and analysis of sport-specific physical and psychological variables; physiological monitoring; external sources of data relating to sports performance; reliability of data and sources. The use of performance indicators in performance analysis

Unit 4	Feedback based analysis of performance, Sport-specific notational systems; computerized notational analysis; notation in individual sports; notation in team sports; augmented feedback through video-based technologies; modelling of
	competitive sport; analysis of structures of sports informing performance indicators; flowcharts and presentation models of sports performance; reliability and validity of notational data; data processing; probability analysis; literature searching; critical evaluation of literature

SE CC14-(PR)-P04 : Practical

FUNDAMENTALS OF EXERCISE PHYSIOLOGY &
PRINCIPLES OF SPORTS TRAINING

Fundamentals of Exercise Physiology

Learning objectives	To gain skill in measurement of various physiological responses
Learning outcome	Students will be able to measure the changes and interpret them in the context of sports

Experiments	1. Measurement of heart rate and blood pressure during and after exercise. (each student is expected to practice measurement on 50 volunteers and determine intra experimenter and inter-experimenter variation) 2. Heart rate response recording during sporting activities. (To be carried out as project and on sports persons). At least three different sports are to be covered by each student) 3. Cardio-pulmonary resuscitation practice on Human Mannequin 4. Aerobic power measurement using Queens' college test, Astrand-Rhyming test. 5. Tests for anaerobic power (Wingate Test) 6. Determination of Physiological adaptation with training through sub-maximal exercise on treadmill / bicycle ergometer. 7. Target Aerobic Movement Test (Brockport) 8. Measurement of lung volumes and capacities.

Suggested Reading Fundamentals of Exercise Physiology	1. William D. McArdle, Frank I. Katch, Victor L. Katch (2010) Exercise physiology nutrition, energy, and human performance. Lippincott Williams & Wilkins, Baltimore, USA. 2. Astrand, P.-O. and Rodahl, K. (2003) Text book of Work Physiology Physiological basis of exercise. Human Kinetics, USA. 3. Scott Powers and Edward Howley (2014) Exercise Physiology Theory and Application to Fitness and Performance. McGraw-Hill Higher Education 4. K. Birch, D. MacLaren, K. George .(2005) Instant notes in sport and exercise physiology. Garland Science/BIOS Scientific Publishers. 5. Werner W.K. Hoeger, Sharon A. Hoeger (2010) Principles and Labs for Physical Fitness. Wadsworth, Cengage Learning. 6. Joseph P. Winnick and Francis X. Short. (2014) Brockport physical fitness test manual a health-related assessment for youngsters with disabilities. 7. C.L. Ghai (2013) A Textbook of Practical Physiology Jaypee Brothers Medical Publishers (P) Ltd. New Delhi. 8. Tudor Hale (2003) Exercise Physiology A Thematic Approach. John Wiley & Sons Ltd, England 9. Scott Kline Powers, Edward T. Howley. Exercise Physiology Theory and Application to Fitness and Performance, 2012; McGraw-Hill, Boston

Principles of Sports Training

Learning objectives	To gain skill in physical fitness testing

Learning outcome	Students will be able to carry out fitness tests and coaches in training athletes. interpret them to support
Experiments	1. Measurement of Physical fitness using field tests a) AAHPERD test battery b) BROCKPORT test system
	2. Specific tests for each motor component a) Coopers' run-walk test, 2.4 km run test, b) PACER (20-meter and 15-meter) c) One-mile run/walk d) Target aerobic movement test (TAMT) e) Reverse curl f) Seated push-up g) 40-meter push/walk h) Wheelchair ramp test i) Push-up j) Pull-up k) Bench press l) Ggrip strength m) Back-saver sit-and-reach n) 30m flying start and 30 m standing start o) 60m dash p) ROM measurement by Goniometer
	3. Prepare training schedule for any three sports / event
	4.Group assignment Training planning for a target competition

Suggested Reading Principles of Sports Training	1. Werner W.K. Hoeger, Sharon A. Hoeger (2010) Principles and Labs for Physical Fitness. Wadsworth, Cengage Learning. 2. Joseph P. Winnick and Francis X. Short. (2014) Brockport physical fitness test manual a health-related assessment for youngsters with disabilities. 3. ACSM's health- related physical fitness assessment manual. Lippincott Williams & Wilkins, 2008. 4. Tudor Bompa, Carlo Buzzichelli (2019) Periodization-Theory and Methodology of Training, Human Kinetics 5. Hardayal Singh (1984), "Sports Training General Theory and Methods", New Delhi DVS Publications 6. Dick Frank W. (1997), "Sports Training Principles", Bloomsburry, London. 7. Dan Gordon. (2009) Coaching Science.; Learning Matters Ltd, UK. 8. Holt, Laurence E., Pelham, Thomas E., Holt, Jason. Flexibility A Concise Guide. 2008; Humana Press Inc.. New Jersy. 9. Vance A. Ferrigno Lee E. Brown. Training for Speed, Agility, and Quickness. 2015; Human Kinetics, Champaign, IL. 10 Will Freeman. Track & Field coaching essentials. 2015; Human Kinetics, Champaign, IL. 11. Jay Hoffman (2014) Physiological aspects of sport training and performance. Human Kinetics. 12. Terry McMorris and Tudor Hale (2006) COACHING SCIENCE-THEORY INTO PRACTICE. John Wiley & Sons Ltd

SE CC15-(PR)-P05: Practical
Applied Sports Physiology

Learning objectives	To determine the aerobic and anaerobic threshold of athletes.
Learning outcome	To be able to direct and assess aerobic and anaerobic capacity of athletes.
	1. Recording of ECG during sub-maximal, maximal exercise and recovery. 2. Determination of VO2max during sub-maximal, maximal exercise and recovery. 3. Determination of anaerobic power. 4. Determination of muscle strength. 5. Measurement of metabolic / physiological demand of sports a) Ball games b) Racket sports c) Track and Field events d) Combat sports

Suggested Reading Applied Sports Physiology	1. Nigel Thomas and Andrew Smith (2009) Disability, sport, and society an introduction. Routledge, NY 2. Komi, Paavo V. (Ed) (2003) Strength and power in sport. Blackwell Science Ltd, USA 3. Shephard, R.J. and Astrand, P.-0. (1992) Endurance in sport. Blackwell Science Ltd, USA. 4. Ron J. Maughan (2009) The Olympic textbook of science in sport. Blackwell Publishing Ltd 5. Yves C. Vanlandewijck and Walter R. Thompson (2011) The Paralympic athlete handbook of sports medicine and science. Wiley-Blackwell. 6. John Wesson(2002) The Science of Soccer. Institute of Physics Publishing, Bristol and Philadelphia. 7. John J. Fontanella (2006) The physics of basketball. The Johns Hopkins University Press 8. Monèm Jemni (2011) The Science of Gymnastics. Routledge, NY. **9.** T.Reilly, N.Secher, P.Snell and C.Williams ( ) **Physiology of Sports.** SPON PRESS 10. Thomas Reilly (1996)Science and Soccer. SPON PRESS 11. T.Reilly, J.Clarys and A.Stibbe ( ) Science and Football II. SPON PRESS

Second Semester

SE CC21-(TH)-P06: ENVIRONMENTAL EXERCISE PHYSIOLOGY

Learning objectives	The objective of this course is to examine the responses and adaptations of the human body to exercise under different environmental conditions
Learning outcome	Students will be able to describe and discuss the stresses placed on the human body during exercise performed under different environmental conditions and the adaptations made by the body with extended or repeated exposure to those conditions.
Unit 1	Environment and exercise Thermoregulation, exercise in cold - physiological responses to exercise in cold, health risks during exercise in cold, effect of cold on human performance;
Unit 2	Physiological changes in desert, heat illness, heat stroke Exercise in hot environment- physiological responses to exercise in heat, health risks during exercise in heat, exercise in high; Desert and Human Adaptation
Unit 3	Hypobaric and Hyperbaric Condition Physiological changes in Hypobaric and Hyperbaric Condition, safety and management. Exercise underwater. Pressure, O_2, CO_2, Temperature and Relative humidity,
Unit 4	The travelling athlete altitude- Altitude training effect of altitude on sports performance –adaptation to altitude detraining.
Unit 5	Atmospheric requirements of Man in space

SE CC22-(TH)-P07 : BIOMEDICAL INSTRUMENTATION

Learning objectives	The course is extensively, giving participants considerable practical experience of the devices typically found in sports industry.
Learning outcome	□ Understand the health and safety implications of working with closed-loop control systems □ Correctly use a range of sports industrial calibration equipment □ Correctly connect, commission and calibrate current loop devices, lactate analyzer, ECG, radioimmunoassay (RIA), ELISA, and heart devices
Unit 1	Electrical safety, Alternating and direct current circuits, Digital signal processing, Fundamentals of Bio electric Signals(ECG, EMG ,EEG), COMPONENT OF MAN INSTRUMENT SYSTEM, Control, Monitoring, Evaluation, Diagnosis, Information Gathering, CLASSIFICATION OF INSTRUMENTS, Engineering Indicating Recording Monitoring Data Logging Analysis Control Medical Diagnostic Therapeutic Supplementary, Radio graph (x-ray), Ultra sonograph, Tomograph.
Unit 2	Principles of construction and uses of ECG, Principles of construction and uses of EMG, Principles of construction and uses of Telemetric Heart Rate Monitor, Principles of construction and uses of Treadmill and Cycle ergometer, Principles of
	construction and uses of Metabolic Analyzer,
Unit 3	Principles of construction and uses of photoelectric colorimeter and Spectrophotometer, Principles of construction and uses of lactate analyzer, Principles of construction and uses of Electrolyte analyzer, Principles of construction and uses of microscope, Brief idea of CRO, CTI scan, MRJ and PET. Principles and uses of Chromatography,
Unit 4	Principles and method and uses of Electrophoresis. Principles and method and uses of Ultracentrifugation.
Unit 5	Principles of radioimmunoassay (RIA), ELISA

SE CC23-(TH)-P08: RESEARCH METHODOLOGY & STATISTICAL METHODS IN SPORTS

Research Methodology and Computer Applications

Learning objectives	To learn methodology of carrying out scientific research
Learning outcome	Student will be able to generate new research topic, plan and execute research
Unit 1	Types of research; Criteria and Identification of a research problem; Research Design – sampling design, experimental design, variable selection, etc. Tools of Data Collection – sampling, questionnaire, types of data, etc;
	Ethical guideline in research & publication. Plagiarism – what it is; avoiding plagiarism; paraphrasing and its methods. Style manual- (American Psychological
	Association etc.)**;** Publication protocol - Preparation and publication of review article and / or original research work;
Unit 2	Introduction to review of literature – what, why, how; Types of research review and their relevance. Formulation of key questions for a review, keywords/descriptors; Searching the literature – sources of literature, Bibliographical database, other web sources; methods of literature search – keywords and Boolean logic. Evaluation of scientific literature; Organizing literature – strategies, use of software; Meta analysis. Writing review – structuring the review, quoting/paraphrasing, the citation referencing system,
	Fundamentals of computer, Basic principle and use of computer. Hard ware, software, Net working, Application of computer in biology.

Statistical Methods in Sports

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Learning objectives	To understand Reserach Methods, Processing & Presentation of Data & Analysis Techniques using software programmes.
Learning outcome	Enables students to Learn Scientific Methods, Statistical Analysis Techniques Using Software Programmes and Manually.
Unit 1	Probability and distribution; Descriptive statistics; Inferential statistics – parametric statistics and non-parametric statistics
Unit 2	Errors in research, Errors types; Methods of Data Collection, Processing and Analysis of Data, Sampling Fundamentals,
Unit 3	Testing of Hypotheses-I (Parametric or Standard Tests of Hypotheses), Chi-square Test, Analysis of Variance and Covariance, Testing of Hypotheses-II (Nonparametric or Distribution-free Tests),
	Multivariate Analysis Techniques, Correlation and regression, Graphical presentation of data.
	Modelling the development of world records in running, Statistical analysis of the effectiveness of the FIFA World Rankings, Outcome uncertainty measures how closely do they predict a close game? Patterns of world records in sports, Competition, rankings, and betting in soccer.

SE CC24-(PR)-P09 : Practical

Environmental Exercise Physiology

Learning objectives	To lean the methods of measurement of environmental variable
Learning outcome	Be able to measure and assess environmental condition for improving performance

	□ Measurement of different heat stress indices □ WBGT, ET, CET,; measurement of relative humidity. □ Determine body fluid loss by assessing sweat rate during exercise. □ Determine body fluid loss by assessing urine output. □ Determine hydration status by urine colour examination. □ Determine the effect of hot and humid condition on exercise performance. □ Determine the effect of cold condition on exercise performance.
Suggested Reading	

SE CC25-(PR)-P10 : Practical

Statistical Methods in Sports & Computer Applications

Statistical Methods

Learning objectives	To practically determine the various statistical analysis and equation used for data analysis and the understanding statistical tools and siftware.
Learning outcome	To be able carry out basic statistical analysis using software.
	1. Descriptive statistics (Central tendency, dispersion, CI, distribution test). 2. Box plot, X-Y plot, fitting equations, non-linear plots, funnel plot. 3. Student's 't' test, ANOVA, ANCOVA. 4. Correlation and regression (Linear), partial correlation, Logistic regression. 5. Non-parametric tests (Chi, Kendall's Tau, Odds ratio, etc.) Application of Statistical software SPSS, STATISTICA etc.

Suggested Reading Statistical Method	1. Dutta N.K. Fundamentals of Bio-Statistics. 2002; Kanishka Publishers, New Delhi. 2. Gupta S.P. Statistical Methods. 2004; S. Chand & Sons, New Delhi 3. Ruud H. Koning and James H. Albert (2008) Statistical thinking in sports. Chapman & Hall/CRC, Taylor & Francis Group

Computer Applications

Learning objectives	To learn data collection methods and computer use
Learning outcome	Will be able to execute data collection, data reduction, and data analysis.
	1. Importance of computers, Basics of scientific computing, Algorithms and Flowcharts 2. Data acquisition and data processing; Modeling (mathematical, IT based, biomechanical, physiological) and Simulation (interactive, animation etc.) 3. Practice of literature search and review writing 4. Prepare diagram/figures using computer software-MS Excel, MS Word, MS PowerPoint 5. Programming in Phython 6. Use of PhysioNet data and analysis system

Suggested Reading Research Methods and Computer applications	1. Kothari, C.R. Research Methodology. 2004; New Age International, New Delhi. 2. Baca, A. Computer Science in Sports - Research and Practice. 2014; Routledge, Taylor and Francis, UK. 3. Fink, A. Conducting research literature reviews from the Internet to paper. 2009; Sage Publications, New Delhi. 4. Hart, C. Doing a literature review Releasing the social science research imagination. 1999; Sage Publications Limited, New Delhi. 5. O' Donoghue, P. and Holmes, L. Data Analysis in Sport (Routledge Studies in Sports Performance Analysis) 1st Edition, 2014; Routledge, UK. 6.Ridley, D. The literature review a step-by-step guide for students. 2012; Sage Publications Limited, New Delhi. 7. ICMR. Ethical Guidelines for Biomedical Research on Human Subjects. 2006; ICMR, New Delhi. 8. Silyn-Roberts H. Writing for Science and Engineering Papers, Presentations and Reports. 2002; Butterworth-Heinemann, UK.

Third Semester

SE CC31-(TH)-P11 : SPORTS BIOMECHANICS

Learning objectives	1. To study about kinetic and kinematics concepts for analyzing human movements 2. To study about linear kinematics of human movement 3. To study about angular kinematics of human movement 4. To provide the knowledge of linear and angular kinetics as applied to human movement
Learning outcome	1. Describe motion with precise, well defined mechanical 2. Understand and quantify linear and angular characteristics of motion 3. Understand the quantitative relationships between angular and linear motion characteristics of a rotating body 4. Understand and quantify the cause and effect relationship between force and linear and angular motion 5. Understand the mechanics of human body on water
Unit 1	Exercise and sports biomechanics basic concepts of kinematics and kinetics – vectors, motion, degrees of freedom, force, moment of force, equilibrium.
Unit 2	Biomechanical considerations in reducing sporting injury rates.
Unit 3	Posture static and dynamic posture, postural diversity within individuals, posture and its relationship to somatotype posture assessment, desirable postures for high level sport performance, modifying posture and technique to improve performance.
Unit 4	Image analysis in sports performance errors in motion analysis, planar video analysis, 3d motion analysis, data filtering.
Unit 5	Movement patterns – the essence of sports biomechanics, Qualitative analysis of sports movements, More on movement patterns – the geometry of motion, Quantitative analysis of movement, Causes of movement – forces and torques.

SE CC32-(TH)-P12 : KINESIOLOGY AND MOTOR LEARNING

Learning objectives	□ Define Kinesiology and explain its importance to the students of human motions. □ Describe The major components of a sports kinesiological analysis.
Learning outcome	□ Develop knowledge, skills, and abilities related to performance physiology techniques, testing and training
Unit 1	Foundations of Kinesiology Definition, its importance in human motion. Anatomy- Anatomical position and terminology (e.g., planes, directions), Individual muscles/muscle groups, Muscle attachments, Muscle fiber direction, Tendons, Fascia, Joint structure, Ligaments, Bursae, Dermatomes. Planes of Motion, Cavities of the Body, Body Movements, Muscle Movers.
Unit 2	Physiology- Properties of Muscle, Excitation of muscle, Mechanism of muscle contraction, Types of muscle contractions (e.g., concentric, eccentric, isometric). Kinesiology- Actions of individual muscles/muscle groups, Types of muscle contractions (e.g., concentric, eccentric, isometric).
Unit 3	Joint movements, Movement patterns, Proprioception. study of human body movements, performance, and function.
Unit 4	Applications of kinesiology. Adaptation through exercise, Neuroplasticity, Motor redundancy. Major components of kinesiological analysis, Description of selected motor skill, breaking it down into component phases and identifying starting and ending points,
Unit 5	The simultaneous-sequential nature of a variety of movement skills, Classification of motor skills, Using of classification system, Mechanical purpose of movement skills, Methods of identification of the joints and basic muscle groups actively involved in movement skill.

SE CC33-(PR)-P13: Practical

Sports Biomechanics and Kinesiology

Sports Biomechanics

Learning objectives	To learn application of theoretical aspects for improving sporting performance
Learning outcomes	
	1. Biomechanical study of work posture, joint angle study, determination of spinal curvature, analysis of posture by video graphic method – OWAS, REBA, RULA, OCRA etc.Determination of range of motion. 2. Determination of center of gravity of human body under resting and working conditions. 3. Determination of gait pattern. 4. Determination of foot pressure. 5. Determination of Planar video analysis. 6. Determination of 3d motion analysis, data filtering.
Suggested Reading	

Kinesiology

Learning objectives	
Learning outcome	Evaluate the learner's motor skill performance level and determine appropriate progressions to improve performance by using equipments.
	1. Correctly identify and label the composition, structure and types of bone using skeletal models. 2. Differentiate accurately between palpating tendon, muscle, bone, artery and nerve. 3. Properly demonstrate and instruct the osteokinematic movements of the body -flexion, extension, rotation etc. 4. Analyze precisely a given functional activity by joint angle, joint movements and muscle activity. 5. Analyze accurately activities based on the center of gravity and base of support of a person. 6. Identify accurately and palpate the structures, bones and bony landmarks of the upper and lower extremities. 7. Prepare a description of a selected motor skill, breaking it down into component phases and identifying starting and ending points.
	Determine the simultaneous-sequential nature of a variety of movement skills.

Suggested Reading Kinesiology	1. Terry Wood, Weimo Zhu. Measurement Theory and Practice in Kinesiology. 2006; Human Kinetics. 2. Peter Klavora. Foundations of Kinesiology 3. Studying Human Movement and Health. 3rd Edition, 2007; Sport Books Publisher. 4. Declan Connolly. Basic and Applied Sports Kinesiology. 2016; LWW 5. Bruce Abernethy, Vaughan Kippers, Stephanie Hanrahan, Marcus Pandy, Ali McManus, Laurel Mackinnon. Biophysical Foundations of Human Movement 3rd Edition. 2013; Human Kinetics.

SE GEC31-(TH)-P14: Students will opt subjects offered by other Departments

SE GEC32-(TH)-P15: Students will opt subjects offered by other Departments

Fourth Semester

SE CC41-(TH)-P16: CLINICAL EXERCISE PHYSIOLOGY

Learning objectives	It will present an introduction to clinical exercise physiology through the topics of: Exercise and disease, Legal and Ethical Considerations, weight training for cardiac rehabilitation etc.
Learning outcome	Understand the cardiovascular, respiratory and metabolic responses to the acute physical activity of differing intensities and compare the responses of individuals of differing levels of fitness to a range of relative and absolute exercise intensities.
Unit 1	Disease, exercise and health- Exercise, fitness and health, Physiological benefits of exercise, Exercise and disease.
Unit 2	Exercise physiology in prevention and rehabilitation of cardiovascular diseases physiological bases for using exercise in CHD prevention, exercise tests for assessment of cardiovascular dysfunctions, exercise induced indicators of coronary heart diseases.
Unit 3	Principle of exercise testing in cardiac rehabilitation, exercise prescription of cardiac patients, weight training for cardiac rehabilitation.Exercise prescription for pulmonary diseases, neuromuscular diseases, and renal disorders.
Unit 4	Exercise for diabetic patients. Exercise prescription for pregnancy. Effect of exercise on cancer. Demonstrating Functional Outcomes for Health and Fitness.
Unit 5	Legal and Ethical Considerations.Exercise prescription for health- Screening and exercise testing, Guidelines for exercise prescription, Special populations

SE DSEC41-(TH)-P17: (Theory) Students will opt subject offered by the Department

SE DSEC42-(TH)-P18: (Theory) Students will opt subject offered by the Department

SE DSEC43-(PR)-P19: (Practical) Students will opt subject offered by the Department

SE DSEC44-(PS)-P20: (Project & Seminar) Students will opt subject offered by the Department

(Detailed syllabus of DSEC are in page 31-36)

[Project work (Summer Project) & Seminar: *Students will submit and present performance report of their summer project opted at end of the session of 2nd Semester, for their specific DSE course assigned during 4th Semester curriculum. A project will be performed during the summer research training in a reputed laboratory of excellence. A presentation of the accomplishments will be required before a panel of experts. Evaluation will be based on both the project report and presentation.]*

[Viva: *Students will be evaluated on all the topics discussed in the two years programme by a panel of experts.]*

DISCIPLINE SPECIFIC ELECTIVE COURSE (DSEC)

Offered by the Parent Department
for the Students of "Sports Physiology"
Assigned for 4th Semester Curriculum

Detailed Syllabus for theory and practical classes under DSEC curriculum during 4th Semester.

Students will opt any one of the following subjects offered by the Centre. Selection will be made on merit basis during 2nd Semester curriculum. Each paper carry 50 marks equivalent to 4 credits.

1. **Yoga in Sports**
2. **Exercise physiology and Gender**

DSEC-1: YOGA IN SPORTS

Learning objectives	Learn basic philosophical and spiritual aspects of Yoga and how it could be applied to improve performance in sports
Learning outcome	Students will be able to apply Yoga to reduce stress in sports persons
SE DSEC41-(TH)-P17 : **Basic Yoga**	
	General introduction to yoga and Indian philosophy History, Evolution of Yoga and Schools of Yoga, Basic Yoga Texts Philosophy, Patanjali Yoga Sutra, Shivasamhita, Gherandasamhita, Concept by Swami Vivekananda;
	Shodhana-Kriyas And Asanas, Hatha Yogic Practices : Hatha Yoga Practices Pranayama, Bandhas And Mudras Meditation.
SE DSEC41-(TH)-P18: Yoga and Sports	
	Yoga and Sports : Ideal performance and Peak performance for sport persons; Enhancing Physical capacities; Integrated system of yoga practices to increase cognitive and motor skills with learning for performance improvement. Warm-up or loosening exercises; Strengthening poses; Relaxing postures; Yogic breathing practices, Yogic exercises like Suryanamaskar to development strength, flexibility and endurance power.

	Yogic Management with respect to Health, Diseases & Hygiene; Diet & Nutrition; Therapeutic use; Preventive Health Care; Yogic Contribution for- Maintaining wellness, Healthy living, Stress management, Physical fitness management, increasing concentration of mind.

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SE DSEC43-(PR)-P19 : Practical

Learning objectives	Learn Yoga through Practice
Learning outcome	They will be able to formulate yoga programmes for sports persons
	a. The following are to be practiced by the students 1. Loosening Exercise, Sukshma Vayama, Yogic Stretching Exercise (Suryanamaskar) 2. Satkarma / Cleansing Practices- Dhauti, Neti, Kapalabhati, Agnisara 3. Yogasana postures that involve - Standing, Sitting, lying in Supine and Prone, Inverted, , Balancing, forward bending, backward bending 4. Pranayama : Concept of correct breathing, Deep Breathing, Nadi Shodhana, Bharamari, 5. Bandha & Mudra : Concept of Bandha & Mudra, Jalandhar Bandha, Uddiyana Bandha, Mula Bandha, Viparitkarani Mudra 6. Meditation: Guided Meditation, Transcendental Meditation b. Students will design Yoga programmes for different sports groups based on scientific knowledge.

Suggested Readings Yoga in Sports	1. Bianca MacHliss and Simon Borg-Olivier. Applied Anatomy & Physiology of Yoga. 2005; Yogasynergy 2. M. M. Gore. Anatomy and Physiology of Yogic Practices Understanding of the Yogic concepts and physiological mechanism of the yogic practices . 2017; New Age Books. 3. H. David Coulter (2001) Anatomy of Hatha Yoga. Body and Breath, Inc., 2114 Ames Hill Rd., Marlboro, VT 05344 USA 4. Swami Vivekananda Rajayoga, Advaita Ashram, Culcutta, 2000 5. Woods, J.H. The Yoga System of Patanjali, M.L.B.D., Delhi, 1988 6. BKS Iyenger(2005) The Illustrated Light on Yoga. Harper Collins Publishers. 7. Burnier, Radha: Hathayoga Pradipika of Svatmarama, The Adyar Library publications, Chennai. 2000 8. Burley, Mikel: Hatha Yoga, Its' Context Theoryand Practice (M.L.B.D. Delhi, 2000) 9. Gheranda Samhita: Shri Sadguru Publication, New Delhi. 10. Dr R Nagarathna and Dr H R Nagendra: Yoga and Health, Swami Vivekananda Yoga Prakashana, 2002

SE DSEC44-(PS)-P20 : Project work &**S**eminar

DSEC-2: EXERCISE PHYSIOLOGY AND GENDER

Learning objectives	To develop knowledge about the issues of female athletes
Learning outcome	The student would be able to understand the problems of female athletes and suggest remedial measures
SE DSEC41-(TH)-P17: Physiology of the Female Athlete	
	Women and the Olympic Games; Physiology of the Female Athlete; Anatomy of male and female, Body type and composition, Physiology of male and female reproductive system, The Prepubescent Female
	Growth, Performance, Activity, and Training During Adolescence, Musculo-skeletal system, Cardio-respiratory system, Aerobic capacity, Strength. Training adaptation. Nutrition and metabolism,
SE DSEC41-(TH)-P18: Performance of Female Athlete	
	The female athlete triad, eating disorders, body weight control and training in female menstruation and other related factors, Exercise and pregnancy. Menstruation and Menstrual Disorders,. Menopause, Hormone Replacement Therapy
	The Breast and related injuries; protective clothing, Orthopaedic Concerns; Gender Verification

SE DSEC43-(PR)-P19 : Practical

Learning objectives	To learn techniques and methods of testing female athletes
Learning outcome	The student will be able to able to detect different disorders and condition of the female athlete
	1. Determination of VO2max of male and female athletes (height, weight, age matched). 2. Determination of anaerobic power of male and female athletes (height, weight, age matched). 3. Determination of strength of male and female athletes (height, weight, age matched). 4. Determination of lung volumes and capacities of male and female athletes (height, weight, age matched). 5. Survey of issues related to female athletes 6. Detection of eating disorder
Suggested Reading Exercise Physiology and Gender	1. Mona M. Shangold, Gabe Mirkin (1994) Women and exercise : physiology and sports medicine. F. A. DavisCompany 2. Barbara L. Drinkwater (Ed) (2000) Women in sport. The encyclopaedia of sports medicine; v. 8. Blackwell Science Ltd 3. Catherine M. Gordon and Meryl S. LeBoff (2015) The Female Athlete Triad A Clinical Guide. Springer New York

SE DSEC44-(PS)-P20 : Project work &**S**eminar

GENERIC ELECTIVE (GE) COURSEOFFERED BY DEPARTMENT OF SPORTS SCIENCES FOR OTHER DEPARTMENTS

Paper – CBCC-X

[one paper for 50 marks in 3rd Semester as draft syllabus for CBCC course offered by the Dept. of Physiology; each module carry 10 marks; 5x10 = 50 marks; Credit - 04]

Title: "Science in Sports performances"

Sports Exercise Physiology

1. Elementary concepts of different physiological systems
2. Physiological measurements of fitness:
3. Exercise & performances
4. Sports apparels, Ergonomics and comfort:
5. Sports Anthropometry

Sports Biochemistry

1. Biomolecules and their chemistry:
2. Cellular structure & function, Cellular signaling:
3. Metabolism& Biochemical pathways:
4. Biochemical analysis in sports:
5. Pharmacology & Doping:

Sports Nutrition

1. Food, nutrients & Bioenergetics:
2. Diet, Diet survey& Nutritional assessment:
3. Food habits& Nutritional disorder:
4. Diet, Exercise, Fitness& performances:
5. Sports food and Nutritional supplements:

Sports Management

1. Human Anatomy and Sports Injury
2. Strategies to decrease risk of injury:
3. Drugs in sports
4. Ethical issues in sports
5. Sports training & management:

Sports Psychology

1. Sports Psychology: Basics
2. Sportsmanship
3. Cognition, behaviourand performances
4. Performances in Sports and Psychological aspects
5. Self-regulation techniques; emotion management,

The regulations for Two-year M. Sc. Course in Sports Nutrition, University of Calcutta

ADMISSION CRITERIA

1. The University of Calcutta shall provide instructions leading towards two year M.Sc. degree.
2. **Eligibility for admission in M.Sc. Neuroscience:** At least 55% marks in B.Sc. Hons in all branches of Sciences including Physiology and all allied subjects of Life Sciences, Physics, Chemistry and Mathematics.All candidates should have Science subjects in Higher Secondary level. M.B.B.S/B.Sc. (Ag)and allied graduatesare also eligible. Reservation of seats will be governed by the rules of Govt. of West Bengal at present.
3. Applicants from University of Calcutta will get admission to the sixty percent of seats (Category-A). Forty percent of the seats (Category-B) will be filled up from candidates from both CU and non CU from a common merit list prepared on the basis of a Common Entrance Test. The criteria for the preparation of the merit list will be determined by individual departments. Non-CU students, however, will have to satisfy the same eligibility criteria applicable to the students of the University of Calcutta. A **Common Entrance Test** will be conducted for the 4 (four) courses including i) Exercise Physiology (SE), ii) Sports Biochemistry (SB), iii) Sports Nutrition (SN), iv) Sports Physiotherapy (SP). The Common Entrance Test will be MCQ type covering the fields of Life Sciences and all Natural Sciences.
4. The duration of the course shall be two academic years and the examination for the M.Sc. degree shall be held over four semesters over a total of 1000 marks and 80 credits. The duration of the semesters shall be as follows:

1st Semester	**July - December**
2nd Semester	**January - June**
3rd Semester	**July – December**
4th Semester	**January - June**

5. The course curriculum includes **Core courses** (offered by the Department), **Discipline Specific Elective Courses** (offered by the Department) and **Generic Elective Courses** (offered by the other Department).
6. A student will have to take **two courses** from **Generic Elective Courses (GEC) offered by the other Departmentsin 3rdSemester curriculum** in addition to courses offered by the Parent Department. Each course will carry credits according to the number of theoretical classes required, study hours and laboratory hours.
7. A student will have to take **one course** from **Discipline Specific Elective Courses(DESC)**offered by the **Parent Department in 4th Semester curriculum** inaddition to**Core Courses** offered by the Parent Department.The course will carry credits according to the number of theoretical classes required, study hours and laboratory hours.
8. A candidate shall be eligible for appearing at the examination provided he/she prosecutes a regular course of studies maintaining percentage of attendance as specified by the University.
9. Examinations would be held after the completion of curriculum at the end of each semester. However, evaluation of the practical will be based on continuous assessment as well as on the final Viva-Voce examination of the students on the experiments. The examination time allotted for each paper carrying 50 marks is 2 hours.

PASSING CRITERIA

10. A candidate is required to appear at the examination in each and every paper/course/module/part/group of the respective syllabus. A candidate in order to be declared to have passed an examination, must obtain at least 40% marks in each paper/course/module/part/group. In case of a paper/course/module/part/group containing both theoretical and practical portions, a candidate is required to secure at least 35% marks separately in the theoretical and practical portions and at least 40% marks in aggregate in that paper.
11. If a student gets 'F' in a particular course, he/she shall be deemed to have failed in that course only and shall be required to write a supplementary examination to be offered within six months.
12. The students will get a maximum of three academic years to complete the M.Sc. course.

CRITERIA FOR RE-APPEARING AT SUPPLEMENTARY EXAMINATION

13. All supplementary examinations shall be held after six months of the original examination. Having **failed** or **absent** in maximum two papers/courses a candidate shall be eligible to appear at the supplementary examination. A candidate who has **failed** in more than two papers will have to appear at the same semester without appearing at the higher semester and without attending the classes. Candidate who fails in one or two papers can clear the paper/s in two more consecutive chances **(excluding the main examination)** along with higher semester examination. If the candidate is unable to clear the same within two consecutive chances, he shall be dropped from the concerned course. A failed candidate, intending to re-appear in a subsequent semester has to take permission from the concerned Faculty Secretary through the Head of the Department immediately after publication of result.

ABSENT CRITERIA

14. Failure to fill up the examination form shall be considered as missing a chance and such candidates who have not filed up the examination form shall have to appear at the same semester examination. A candidate who has filled up the examination form but remains absent in the entire examination or more than two courses will be considered to have lost a chance and shall be required to re-appear at the same semester examination. A candidate remaining absent in one or two papers/courses but clearing the other papers/courses shall be considered to have failed in those papers/courses in which he remains absent and shall be eligible to clear those as stated above.
15. If all the chances of a candidate (Main + 2) has been exhausted, he has to drop or leave the course. He may apply for re-admission in the same course of study in the 1st Semester of the next academic session along with the fresh applicants.

Results Determination criteria

CALCULATION OF GRADE POINTS, SGPA AND CGPA

Credit-weighted grade point system will be followed and therefore only the grade points but not the overall percentage of marks either in individual paper or in aggregate marks will be provided.The grade points will be given according to the following computation.

Grading of students' performance:
Grade scores will be calculated in a scale of 6 (six) as per the following table:

Marks (%)	Grade Score Brackets	Grade Score added per each additional mark to minimum grade score in the bracket
80-100	5.00 - 6.00	0.05
70-79	4.50 – 4.99	0.05
60-69	4.00 – 4.49	0.05
55-59	3.75 – 3.99	0.05
50-54	3.50 – 3.74	0.05
40-49	3.00 – 3.49	0.05
00-39	Below 3.00	0.075

Award of Grade Points:
For example, if a student scores 53% in theory and 68% in practical in a 3-credit course (2+1), his/her grade point for the course will be as follows:

$$\text{Grade point} = \frac{2x(3.5+0.05x3)+1x(4.0+0.05x8)}{2+1} = 3.90$$

For a credit course with no practical component, for example a 2-credit course, if a student scores say, 56%, then the grade point will be:

$$\text{Grade point} = \frac{2x(3.75+0.05x1)}{2} = 3.80$$

Semester Grade Point Average (SGPA):
The computation of average grade point of a student in a semester will be worked out as follows:

Nth Semester

Course	Credits	Grade Scored
1	3+1	5.65
2	3+1	5.33
3	2+0	3.99
4	2+0	5.05
5	3+1	4.22
6	3+1	4.46

Semester Grade Point Average (SGPA) = 4.836

$$SGPA = \frac{(5.65x4)+(5.33x4)+(3.99x2)+(5.05x2)+(4.22x4)+(4.46x4)}{20} = 4.836$$

Cumulative Grade Point Average (CGPA) over four semesters:
Working out simple average of SGPA obtained over four semesters, cumulative grade point average will be given after four semesters.

Significance of grades:
On the basis of the cumulative results of the student's performance, the following grades will be given in each semester as well as over four semesters.

Grade points	**Grades**	**Class**
5.00 - 6.00	Outstanding (O)	First (I)
4.50 – 4.99	Excellent (A+)	First (I)
4.00 – 4.49	Very good (A)	First (I)
3.75 – 3.99	Good (B+)	Second (II)
3.50 – 3.74	Fair (B)	Second (II)
3.00 – 3.49	Satisfactory(C)	Second (II)
Below 3.00	Fail (F)	Fail