



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 SCIENCE

UNIVERSITY OF CALCUTTA

MSc in Sports Biochemistry

SYLLABUS AND REGULATIONS

2018

Introduction

Sports performances are done utilizing human body that has limits of movement and capability. Improvement of performance in sport would require corresponding changes in the functional ability of the body systems. Training design heavily depends on the available physiological capacities and changes that are possible by the training stimulus. It becomes essential to know the mechanism of body function and changes in body function due to physical exercise. Exercise physiology is the specialized field of knowledge that deals with changes in human body structure and function due to regular participation in exercise programmes.

Salient points considered in the design

1. Holistic development of students is the main purpose of curriculum.
2. The distribution of credit or marks in practical and theoretical has been kept at 50:50 level.

Program Educational Objectives (PEO's) of the Program

Program Educational Objectives	The Post graduating student is expected to.....
PEO 1	Have opportunity to develop and use their knowledge in the field of Exercise physiology in an integrated manner;
PEO 2	Acquire and imbibe the skills required in Exercise physiology for application in real life situations like training camps, education programmes for athletes;
PEO 3	Develop aptitude for multidisciplinary approach for working in close cooperation with coaches, scientists from other specializations and High Performance Team.
PEO 4	Develop good research-oriented attitude and be able to formulate a research problem, plan and implement projects based on the problem area, recognize and apply results within a specific sport or within the field of specialization.

Program Outcomes (PO's) of the PG Program–

The intended outcomes are aligned with the educational objectives and are listed below

Program Outcomes	By the end of the program post graduating students should
PO 1	Be able to carry out physiological testing on various sports groups and deliver support to the coaches and athletes
PO 2	be well conversant with the process of training, training camps, training cycles, competition cycles and the likes.
PO 3	be able to critically analyze and handle complex situations in sporting activities arising during the Long Term Athlete Development Program.
PO 4	Be competent to analyze and apply current development and research works in the field of sport science.

PO 5	Be able to welcome new ideas and have capability in out of box thinking.
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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 4 credits. Credits under DSE may vary (16/12/8) depending upon the number of DSE offered across the semesters.
- **Discipline Specific Elective (DSE):** These may be considered similar to Special paper and may also be chosen from an unrelated discipline.
- **Generic Elective (GE):** They will focus on those courses which add generic proficiency to the students. Students may take Generic Electives from Department other than the parent Department.
- **Semester Grade Point Average (SGPA):** It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It is

expressed upto two decimal points.

- **Cumulative Grade Point Average (CGPA):** it is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of total credits of all courses in all the semesters. It is also expressed upto two decimal points
- **Grade Point:** It is the numerical weight allotted to each letter grade on a 10 point scale.
- **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.
- **Transcript or Grade Card:** Based on the grades earned, a grade certificate is issued to all registered students after every semester. The certificate displays the course details along with SGPA of that semester and CGPA earned till that semester

Scheme of

Examination: An

example:

1. English shall be the medium of instruction and examination.
2. For each course, the total marks are 100, of which 50 are internals (continuous evaluation) and 50 are based on external examination (final end semester) except for Employability Skills course I each semester , the marks of which will be based on viva voce
3. The continuous evaluation shall be based on factors such as participation in case studies, group activities, class attendance, class tests, midterm test, assignments and viva voce.
4. The end semester final examination duration for each course is 3 hrs.

Instructions for paper setting

The paper is to be divided into two sections. First part shall contain 5/6 questions of which 4 are to be attempted. Part two of the paper shall consist of case study/ conceptual question which would be compulsory for the student to attempt. Each question will be of equal marks. In framing the question paper, attempt shall be made to cover the entire syllabus.

Award of Degree

A student shall be awarded the degree subject to:

- (i) He/she has registered himself/ herself, undergone the courses of studies, completed the internship and project report specified in the curriculum of his/ her program within the stipulated time, and secured the minimum credits and CGPA prescribed for award of the concerned degree
- (ii) There are no dues outstanding in his/her name to the Institute/ Centre of the University and
- (iii) No disciplinary action is pending against him/ her.
- (iv) A student is required to earn minimum credits = (total credits offered in the program – No. of credits not exceeding 6 credits).

The above degree will be awarded with distinction if a student has earned a minimum CGPA of with pass in all subjects in first attempt.

The maximum permissible period for completing the program is 4 years from the date of registration. However, if a student fails to do so, he/she may be permitted to register again to that program after getting the requisite approval of the Vice Chancellor.

Provision for Reappearing

Reappear in all Theory / Practical / Viva based courses / Practical based courses shall be permitted. The reappear examinations will be scheduled with the end semester examinations.

Grading Scheme

Range	Grade	Grade Point (GP)
95% - 100%	O (Outstanding)	10
85% - 94%	A+ (Excellent)	9
75% - 84%	A (Very Good)	8
65% - 74%	B+ (Good)	7
55% - 64%	B (Above Average)	6
45% - 54%	C (Average)	5
40% - 44%	P (Pass)	4
	F (Fail)	0
	Ab (Absent)	0

Computation of SGPA and CGPA

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student.

Calculation of SGPA

$$SGPA(S_i) = \frac{\sum C_i * G_i}{\sum C_i}$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

Calculation of CGPA

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme

$$CGPA = \frac{\sum C_i * S_i}{\sum C_i}$$

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts

Overall Curricular structure

	Courses under CGPA			
	Core	DSEC	Generic Elective	Total Credits
Total credit allowed	56	16	8	80 (40 credit in each year)
Semester I	20			
Semester II	20			
Semester III	12		4X2	
Semester IV	04	4X4		

Sl. No.	Topic	Details	Page
1.	ORIENTATION OF COURSES	Semester-wise distribution of courses	9-10
2.	Detailed Syllabus		
2.1.	Core Courses	1st Semester – 20 credits (4 credits X 5 papers) 2nd Semester - 20 credits(4 credits X 5 papers) 3rd Semester – 12 credits (4 credits X 3 papers) 4th Semester – 04 credits (for one paper)	11 12 13 14
2.2.	Discipline Specific Elective Courses (DSEC)	DSEC will be offered by Parent Department students included in 4th Semester	14
2.3.	Generic Elective Course (GEC)	GEC will be offered by the Departments for Students of Other Department, “Sports Science” included in 3rd Semester. ---- 08 credits (4 credits X 2 papers)	

**M.Sc. in Sports Biochemistry:
2-Years Semester Course in CBCC**

Subject Code	Theory/ Practical /Project	Subject	Marks	Credit
<u>1st SEMESTER (CORE COURSES)</u>				
SB CC11-(TH)-P01	Theory	Fundamentals of Human Systems -1	50	4
SB CC12-(TH)-P02	Theory	Biomolecules and Metabolism -1	50	4
SB CC13-(TH)-P03	Theory	Bioenergetics and Enzymes	50	4
SB CC14-(PR)-P04	Practical	Analytical Biochemistry: Fundamental and Contemporary	50	4
SB CC15-(PR)-P05	Practical	Analytical Biochemistry Specific for Sports	50	4
Total			250	20
<u>2nd SEMESTER (CORE COURSES)</u>				
SB CC21-(TH)-P06	Theory	Fundamentals of Human Systems -2	50	4
SB CC22-(TH)-P07	Theory	Biomolecules and Metabolism -2 and Nutritional Biochemistry	50	4
SB CC23-(TH)-P08	Theory	Research Methodology & Biostatistics	50	4
SB CC24-(PR)-P09	Practical	Exercise Physiology & Metabolism Analysis	50	4
SB CC25-(PR)-P10	Practical	Sports Nutrition and Analysis	50	4
Total			250	20
<i>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.</i>				
<u>3rd SEMESTER (CORE COURSES & GENERIC ELECTIVE COURSES)</u>				

SB CC31-(TH)-P11	Theory	Sports and Immune System	50	4
SB CC32-(TH)-P12	Theory	Sports and Molecular Biology	50	4
SB CC33-(PR)-P13	Practical	Metabolism of Specific Organs (Cardiac, Respiratory, Neuronal, GI, Endocrine)	50	4
SB GEC31-(TH)-P14	Theory	CBCC-X or other codes: Students will opt subjects offered by other Departments	50	4
SB 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)				
SB CC41-(TH)-P16	Theory	Applications of Advanced Biochemical analysis for Sports Performance and Match Analysis	50	4
SB DSEC41-(TH)-P17	Theory	Students will opt subjects for DSEC	50	4
SB DSEC42-(TH)-P18	Theory	Students will opt subjects for DSEC	50	4
SB DSEC43-(PR)-P19	Practical	Practical on subjects for DSEC	50	4
SB DSEC44-(PS)-P20	Project	Students will opt subjects offered by the Departments (a) Project work & Seminar ; (b) Viva	50	4
Total			250	20
<i>"P" stands for paper</i>			1000	80
Grand Total				

Detailed Syllabus

Subject Code	Theory/ Practical /Project	Subject	Marks	Credit
<u>1st SEMESTER (CORE COURSES)</u>				
SB CC11-(TH)-P01	Theory	Fundamentals of Human Systems: Biochemical and Functional Approach <ol style="list-style-type: none"> 1. Systems, organs, Cells and Biomolecules: Interactions, Basic Anatomy of Human Body 2. Blood and Fluid system 3. Musculo-Skeletal System 4. Nervous System and special Senses 5. Cardiovascular System 	50	4
SB CC12-(TH)-P02	Theory	Biomolecules and Metabolism -1: Functional Approach <ol style="list-style-type: none"> 1. Carbohydrates, Chemistry and Functional Role 2. Proteins: Chemistry and Functional Role 3. Lipids: Chemistry and Functional Role 4. Nucleic acids: Chemistry and functional Role 5. Micronutrients and Water 	50	4
SB CC13-(TH)-P03	Theory	Bioenergetics and Enzymes <ol style="list-style-type: none"> 1. Kinetics, Reactions and Molecularity 2. Concepts of free energy and strategies of energy metabolism; High-energy biomolecules and energy-rich bonds, 3. Structural basis of enzyme function: Active sites, Coenzymes, Activators, Inhibitors, Kinetics. Allosteric enzymes and their modulators. 4. Mechanism of enzyme induction and repression. Technical approach to the study of enzyme activities. 5. Biological energy transducers and bioenergetics; Oxidative phosphorylation and Photosynthesis, Oxygen toxicity and superoxide dismutase. 	50	4
SB CC14-(PR)-P04	Practical	Analytical Biochemistry: Fundamental and Contemporary: Kinetics, Molecularity, Enzyme Functions.	50	4
SB CC15-(PR)-P05	Practical	Analytical Biochemistry Specific for Sports : Biomolecule separation, Analysis, Clinical analysis of Biomarkers	50	4

			Total	250	20
<u>2nd SEMESTER (CORE COURSES)</u>					
SB CC21-(TH)-P06	Theory	Fundamentals of Human Systems -2 : Functional Approach 1. Gastro-Instestinal System 2. Respiratory System. 3. Excretory System 4. Endocrine and Reproductive System 5. Muscles and Kinesiology	50	4	
SB CC22-(TH)-P07	Theory	Biomolecules and Metabolism -2: Nutritional Biochemistry: 1. Elements of Nutrition: Micro and Macro Nutrients, Water and Electrolytes 2. Major Metabolic considerations of Carbohydrates: Exercise and Sports 3. Major Metabolic considerations of Lipids: Exercise and Sports 4. Other Metabolic considerations: Exercise and Sports 5. Nutrition, Food and Diet in Specific Games, Sports and Yoga.	50	4	
SB CC23-(TH)-P08	Theory	Research Methodology & Biostatistics: 1. Basic and applied concepts of Statistics 2. Testing of Hypothesis, Correlations, Regressions 3. Analysis of Variances: Models and types of ANOVA. 4. Research Methodology, Design of experiment, Data Presentation, Ethics 5. Statistical Applications, Softwares in Sports, other Analytical Methodology	50	4	
SB CC24-(PR)-P09	Practical	Exercise Physiology & Metabolism Analysis	50	4	
SB CC25-(PR)-P10	Practical	Sports Nutrition and Analysis	50	4	
Total			250	20	
<i>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.</i>					

3rd SEMESTER (CORE COURSES & GENERIC ELECTIVE COURSES)				
SB CC31-(TH)-P11	Theory	Sports, Exercise, Yoga and Immune System 1. Basics of Immune system, Antigens, Antigenicity, Immunogenicity, Vaccine, Structure & Function of Antibody Molecules. 2. Primary & Secondary Immune Modulation: Role of cytokines, chemokines & complement 3. Infection, Immunity 4. Immune function and Exercise and Yoga 5. Special and applied considerations of Immune functions in Sports	50	4
SB CC32-(TH)-P12	Theory	Sports and Molecular Biology 1. Central Dogma: DNA, RNA and Proteins and Cell division and Cell Cycle 2. Replication, Recombination, DNA damage and repair, Mutation, Telomere and Special Structure and Functions 3. RNA Metabolism, RNA modification and processing 4. Protein: synthesis, modification trafficking. 5. Gene regulation: Special emphasis on Exercise and metabolism	50	4
SB CC33-(PR)-P13	Practical	Metabolism of Specific Organs (Cardiac, Respiratory, Neuronal, GI, Endocrine) 1. Special metabolic considerations of Respiratory organs in sports and exercises 2. Special metabolic considerations of Brain and associated organs and tissues in sports and exercises 3. Special metabolic considerations of Cardiac tissues in sports and exercises 4. Special metabolic considerations of Endocrine organs and tissues in sports and exercises 5. Special metabolic considerations of GastroIntestinal and other organs in sports and exercises	50	4
SB GEC31-(TH)-P14	Theory	**CBCC-X or other codes: Students will opt subjects offered by other Departments	50	4
SB 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)				
SB CC41-(TH)-P16	Theory	Applications of Advanced Biochemical analysis for Sports Performance and Match Analysis 1. Data analysis and management 2. Biomarkers from special sports events and cases 3. Advanced software for data management 4. Advance techniques 5. Sports and games equipments and their biochemical application	50	4
SB DSEC41-(TH)-P17	Theory	Students will opt subjects for DSEC*	50	4
SB DSEC42-(TH)-P18	Theory	Students will opt subjects for DSEC*	50	4
SB DSEC43-(PR)-P19	Practical	Practical on subjects for DSEC*	50	4
SB DSEC44-(PS)-P20	Project	Students will opt subjects offered by the Departments (a) Project work & Seminar; (b) Viva	50	4
Total			250	20
"P" stands for paper Grand Total			1000	80

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

1. Sports Biochemistry and Performance enhancement
2. Innovation and advanced application in Sports performances

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

"Science in Sports performances"

Appendix for Books and references: Suggested resources

There are a number of text books currently available that cover the subject content of the syllabus. A selection of suitable resources has been provided for each subject area but there are other equally valid texts. There are also many excellent DVDs, Videos, CD ROMs as well as a very large number of internet sites that are all equally appropriate. It is up to individual teachers to choose the support material that best supports their needs and that of their candidates.

Component 1: Physiology of Sport

- Anshel et al. (1991) Dictionary of the Sport and Exercise Sciences. Human Kinetics
- Beashel and Taylor (1996) Advanced Studies in Physical Education and Sport. Nelson
- Blakey, P. (1998) The Muscle Book (2nd Ed). Stafford: Bibliotek Books
- Davis, B., Bull, R., Roscoe, J. and Roscoe, D. (2000) Physical Education and the Study of Sport (5th Ed). London: Harcourt
- Davis, D., Kimmet, T. and Auty, M. (1990) Physical Education: Theory and Practice. Australia: MacMillan
- Honeybourne, J., Hill, M. and Moors, H. (2006) Physical Education & Sport for A Level (3rd Ed). Cheltenham: Stanley Thornes
- Kapit, W., Macey, R. and Meisami, E. (1987) The Physiology Colouring Book. Harlow: HarperCollins
- McArdle, D., Katch, V. and Katch, F. (2005) Essentials of Exercise Physiology (3rd Ed). Lippincott: Williams & Wilkins
- Webster, S. (1996) Sport Psychology: An A Level Guide for Teachers and Students. Widnes: Roscoe Publications
- Wesson, K., Wiggins-James, N., Thompson, G. and Hartigan, S. (2005) Sport and PE: A Complete Guide to Advanced Level Study (3rd Ed), London: Hodder Arnold

Component 2: The Psychology of Sport Learning and Performance

- Anshel et al. (1991) Dictionary of the Sport and Exercise Sciences. Human Kinetics
- Beashel and Taylor (1996) Advanced Studies in Physical Education and Sport. Nelson
- Biddle (1994) Psychology of Physical Education and Sport: A Practical Guide for Teachers. F.I.T. Systems
- Davis B., Bull R., Roscoe J. and Roscoe D. (2000) Physical Education and the Study of Sport (5th Ed). London: Harcourt
- Davis, D., Kimmet, T. and Auty, M. (1990) Physical Education: Theory and Practice. Australia: MacMillan
- Honeybourne, J., Hill, M. and Moors, H. (2006) Physical Education & Sport for A Level (3rd Ed). Cheltenham: Stanley Thornes
- Schmidt and Wisberg (2000) Motor Learning and Performance: A Problem Based Learning Approach (2nd Ed). Human Kinetics
- Sharp B. (1992) Acquiring Skill in Sport. Sports Dynamics
- Webster S. (1996) Sport Psychology: An A Level Guide for Teachers and Students. Widnes: Roscoe Publications
- Wesson, K., Wiggins-James, N., Thompson, G. and Hartigan, S.(2005) Sport and PE: A Complete Guide to Advanced Level Study (3rd Ed). London: Hodder Arnold

Component 3: Sociological Perspectives in Sport

The sociology of sport element of the course is reading intensive. Currently there is not one textbook that accommodates all of the themes assembled here. For this reason a number of indicative texts have been suggested below that would provide content for the course at the broadly appropriate level. In addition, a number of more advanced texts have been included for advanced students and for educators to use as more detailed resources. These have been labelled advanced.

- Cashmore, E. (2000) Making Sense of Sport. London: Routledge.
 - Coakley, J. and Dunning, E. (2003) Handbook of Sports Studies. London: McGraw Hill Higher Education
 - Coakley, J. (1988) Sport in Society: Issues and Controversies. St. Louis: Times Mirror.
 - Giddens, A. (2006) Sociology. (5th Ed), Cambridge: Polity Press
 - Horne, J., Tomlinson, A., & Whannel, G. (1999) Understanding Sport: An Introduction to the Sociological and Cultural Analysis of Sport. London: E & F Spon Press.
 - Holt, R. (1989) Sport and the British: A Modern History. Oxford: Oxford University Press.
 - Houlihan, B. (2003) Sport and Society: A Student Introduction. London: Sage Publications
 - Guttman, A. (1978) From Ritual to Record: The Nature of Modern Sports. Columbia: University of Columbia Press.
 - Jarvie, G. (2006) Sport, Culture and Society: An Introduction. London: Routledge
 - Sage, G. (1990) Power and Ideology in American Sport. Leeds: Human Kinetics
- Advanced texts
- Andrews, D. and Jackson, S. (2001) Sport Stars: The Cultural Politics of Sporting Celebrity. London: Routledge.
 - Brohm, J-M. (1978) Sport: Prison of Measured Time. Worcester: Pluto Press
 - Hargeaves, J. (1986) Sport, Power and Culture. Cambridge: Polity Press
 - Jarvie, G. (1995) Sport, Racism and Ethnicity. London: Falmer Press
 - Houlihan, B. (1994) Sport and International Politics. London: Harvester Wheatsheaf.

- Ingham, A. and Loy, J. (1993) Sport in Social Development: Traditions, Transitions and Transformations. Leeds: Human Kinetics.
- Maguire, J. (1999) Global Sport: Identities, Societies, Civilizations. Cambridge: Polity Press
- Mangan, J. A. (1981) Athleticism in the Victorian and Edwardian Public School: the emergence and consolidation of an educational ideology. Cambridge: Cambridge University Press.
- Mangan, J. P. R. (Ed) (1987) From Fair Sex to Feminism: Sport and the Socialisation of Women in the Industrial and Post Industrial Era's. London: Frank Cass.
- McIntosh, P. (1979) Fair Play: Ethics in Sport and Education. London: Heinemann

Component 4: Performer in Action

- Anshel et al. (1991) Dictionary of the Sport and Exercise Sciences. Human Kinetics
- Beashel and Taylor, (1996) Advanced Studies in Physical Education and Sport. Nelson
- Biddle, (1994) Psychology of Physical Education and Sport: A Practical Guide for Teachers. F.I.T. Systems
- Blakey, P. (1998) The Muscle Book (2nd Ed). Stafford: Bibliotek Books
- Davis, B., Bull, R., Roscoe, J. and Roscoe, D. (2000) Physical Education and the Study of Sport (5th Ed). London: Harcourt
- Davis, D., Kimmet, T. and Auty, M. (1990) Physical Education: Theory and Practice. Australia: MacMillan
- Honeybourne, J., Hill, M. and Moors, H. (2006) Physical Education & Sport for A Level (3rd Ed). Cheltenham: Stanley Thornes
- McArdle, D., Katch, V. and Katch, F. (2005) Essentials of Exercise Physiology (3rd Ed). Lippincott: Williams & Wilkins
- Schmidt and Wrisberg (2000) Motor Learning and Performance: A Problem Based Learning Approach (2nd Ed). Human Kinetics
- Sharp, B. (1992) Acquiring Skill in Sport. Sports Dynamics
- Webster, S. (1996) Sport Psychology: An A Level Guide for Teachers and Students. Widnes: Roscoe Publications
- Wesson, K., Wiggins-James, N., Thompson, G. and Hartigan, S. (2005) Sport and PE: A Complete Guide to Advanced Level Study (3rd Ed). London: Hodder Arnold