

國立體育大學授課教學大綱 (Teaching Plan)

科目中文名稱 Chinese Course Title	運動科學實務與應用 (一)
科目英文名稱 English Course Title	Sport Science Practicum and Application (I)
授課老師 Instructor	Jackson Pui Man Wai 衛沛文
修課條件 Prerequisite	Undergraduate level courses in anatomy, human physiology, and exercise physiology are required. Students with deficiency in prerequisite courses are required to obtain permission from the course instructor.
教學目標 Objective	At the end of this semester, students will be able to: (1) understand the principle of instrumentation and method of measurements of selected areas in the field of exercise physiology research, and (3) Perform measurement of energy expenditure of exercise. (2) Perform laboratory and field tests in the assessment cardiorespiratory functions..
先修科目 Pre Course	“ see prerequisite”
教材內容 Outline	Fundamentals of Scientific Instrumentation: Input sensors or transducers, biosignals (bioelectrical potential, flow, volume, pressure, force, displacement and time, blood biochemistry), signal modifier or conditioner, amplifier, signal processors, storage and output devices (display, recorder, microprocessor, computer-assisted data acquisition system), choosing an instruments (measurement range and span, sensitivity, linearity, %error, resolution, precision, accuracy, sampling rate, response time). Principle of Instrumentation: Validation, calibration, and reliability of instruments. Principle of Measurement: Validity and reliability of measurements. Writing an experimental reports: formats, data reduction and statistical analysis, making tables and figures. Ergometry: Energy, work, power, cycle ergometer, treadmill. Energy Expenditure: Direct measurement of energy - calorimeter; indirect measurement of energy - energy equivalents of food, the caloric equivalent of oxygen, measurement of oxygen uptake and carbon dioxide production, MET, efficiency of exercise. Cardiovascular function: Resting heart rate, exercise heart rate, direct assessment of maximum oxygen uptake (maximum exercise test), indirect assessment of maximum oxygen uptake (submaximal exercise test – cycle ergometer test, step tests, running test, shuttle run test, walking test).

教學方式 Teaching Method	Classroom instructions, demonstration and hand-on experimental work, scientific writing, and written examinations.
參考書目 References	Major Reference books (1) Adams GM. Exercise Physiology Laboratory Manual. Wm.C. Brown. 1990. (2) Cooper CB and Storer TW. Exercise testing and interpretation. Cambridge University Press. 2001. (3) Nieman DC. <i>Exercise Testing and Prescription: A Health-Related Approach.</i> New York, NY: McGraw Hill, 2003. (4) Heywood VA. <i>Advanced Fitness Assessment and Exercise Prescription, 4th ed.</i> Champaign, IL: Human Kinetics, 2002. Other Books, Reports, and research literatures 1. American College of Sports Medicine. <i>ACSM's Health-Related Physical Fitness Assessment Manual</i>, 2nd edition, Lippincott Williams & Wilkis, 2008. 2. American College of Sports Medicine. <i>ACSM's Resources Manual for Guidelines for Exercise Testing and Prescription, 5th edition.</i> Baltimore, Maryland: Lippincott Williams & Wilkis, 2005. 3. Åstrand I. Aerobic work capacity in men and women with special reference to age. <i>Acta Physiol. Scand.</i> 49(Suppl 169): 1-92, 1960. 4. Åstrand P-O. and Rodahl K. <i>Textbook of Work Physiology.</i> New York: McGraw-Hill, 1986. 5. Baumgartner TA and Jackson AS. <i>Measurement for Evaluation in Physical Education and Exercise Science.</i> Boston: WCM/McGraw-Hill, 1999. 6. Consolazio CF, Johnson RE, and Pecora LJ. <i>Physiological Measurements of Metabolic Functions in Man.</i> New York: McGraw-Hill, 1963. 7. Ross RM and Jackson AS. <i>Exercise Concepts, Calculations, and Computer Applications.</i> Carmel, IN: Benchmark Press, 95-103, 109, 1990. Research Papers 1. Åstrand P-O and Ryhming I. A nomogram for calculation of aerobic capacity (physical fitness) from pulse rate during submaximal work. <i>J Appl Physiol</i> 7: 218-221, 1954. 2. Bruce RA, Kusumi F, and Hosmer D. Maximal oxygen intake and nomographic assessment of functional aerobic impairment in cardiovascular disease. <i>Am Heart J</i> 85(4): 546-562, 1973. 3. Jackson AS, Beard EF, Wier LT, Ross RM, Stueville JE, and Blair SN. Changes in aerobic power of men, ages 25-70 yr. <i>Med Sci Sports Exerc</i> 27(1): 113-120, 1995. 4. Jackson AS, Wier LT, Ayers GW, Beard EF, Stueville JE, and Blair SN. Changes in aerobic power of women, ages 20-64 yr. <i>Med Sci Sports Exerc</i> 28(7): 884-891, 1996. 5. Kline GM, Porcari JP, Hintermeister R, Freedson PS, Ward A., McCarron RE, Ross J, and Rippe JM. Estimation of $\dot{V}O_{2max}$ from a one-mile track walk, gender, age, and body weight. <i>Med Sci Sports Exerc</i> 19(3): 253-259, 1987. 6. McMurray RG, Harrell JS, Bradley CB, Deng S, and Deng S, Bangdiwala SI. Predicted maximal aerobic power in youth is related to age, gender, and ethnicity. <i>Med Sci Sports Exerc</i> 34(1): 145-151, 2002. 7. Mitchell JH. The maximal oxygen intake test. <i>J. Clin. Invest.</i> 37(4): 538-547, 1958. 8. Owen OE. Resting metabolic requirements of men and women. <i>Mayo Clin Proc.</i> 63:503-510, 1988. 9. Poehlman ET, Berke EM, Joseph JR, Gardner AW, Katzman-Rooks SM, and Goran MI. Influence of aerobic capacity, body composition, and thyroid hormones on the age-related decline in resting metabolic rate. <i>Metabolism.</i> 41(8):915-921, 1992. 10. Taylor HL, Buskirk E, and Henschel A. Maximal oxygen intake as an objective measure of cardio-respiratory performance. <i>J Appl Physiol</i> 8: 73-80, 1955 11. Wagner PD. Muscle O_2 transport and O_2 dependent control of metabolism. <i>Med Sci Sports Exerc</i> 27(1): 47-53, 1995. 12. Williford HN, Sport K, Wang N, Scharff-Olson M, and Blessing D. The prediction of fitness levels of United States Air Force Officers: validation of cycle ergometry. <i>Mil Med</i> 159: 175-178, 1994.

	13. Wilson DF. Energy metabolism in muscle approaching maximal rates of oxygen utilization. <i>Med Sci Sports Exerc</i> 27(1): 54-59, 1995.
教學進度 Syllabi	請詳載 18 週授課內容(Teaching contents in 18 weeks) Week 1-2 Fundamentals of Scientific Instrumentation Week 3-4 Principle of Instrumentation Week 5-6 Principle of Measurement Week 7 Writing an experimental reports Week 8-9 Ergometry Week 10 Mid-term examination Week 11-13 Energy Expenditure Week 14-17 Cardiovascular functions, review session Week 18 Final examination
評量方式 Evaluation	評量方式與百分比 (Method and percentage) Laboratory (Scientific) reports (40%) Mid-term examination (25%) Final examination (35%)

注意事項：

- 1.課程之中英文名稱請依各開課單位學分科目表填寫。
- 2.本表各欄位如有不足，請自行增列後填寫。

Core Ability Rubric

Core ability	%	Course objectives	Level of skill	Teaching strategy	Evaluation method
1. 具備運用運動生理、運動營養與運動科技知識的能力	30	▪ Demonstrate understandings and application of the context of course material	Academic skill	▪ Classroom instructions ▪ Laboratory / field work ▪ Stimulation of thinking	▪ Scientific reports ▪ Written examinations
2. 具備分析與解決運動科學相關問題的能力	30	▪ Can identify problem types. ▪ Understands the level of complexity of a problem ▪ Develop, evaluate, and test possible solutions	Analytical skill	▪ Classroom instructions ▪ Encourage Critical thinking ▪ Scientific writing skills	▪ Problem solving in scientific reports ▪ Written examinations
3. 具備運動科學專業文獻 (含外語) 之閱讀、寫作及發表 (含外語) 的能力	20	▪ Able to search, identify, screen, and implement research literatures ▪ Able to write a concise and comprehensible scientific report	Integrative skill	▪ Classroom instructions ▪ Scientific writing skills ▪ Citation methods	▪ Scientific reports ▪ Citation of SCI literatures
4. 具備運動科學研究之團隊合作與溝通能力	20	▪ Joins a group cooperatively. ▪ Acknowledge and listens attentively to other members ▪ Be prepared and reliable ▪ Contribute to the end product. ▪ Respect differing points of view ▪ Can take an active position	Practical and social skill	▪ Classroom instructions ▪ Laboratory / field work ▪ Scientific writing skills	▪ Scientific reports – successful completion of all experiments

Scientific Report Rubric (40% of course evaluation)

	Poor 1-4	Average 5-6	Good 7-8	Excellence 9-10	Score
Introduction (10%)	Does not give any information about what to expect in the report.	Gives very little information	Gives too much information	Presents a concise lead-in to the report	
Answers to the issues (60%)	Answers does not related to the issues.	Answers only slightly related to the issues	Answers are somewhat related to the issues	Answers are directly related to the issues	
Conclusion (10%)	Presents an illogical explanation and does not address any of the questions being asked	Presents an illogical explanation and addresses few questions	Presents a logical explanation and addresses some of the questions	Presents a logical explanation and addresses most of the questions	
Grammar & Spelling, Attractiveness, Timeliness (20%)	- Very frequent grammar and/or spelling errors - Illegible writing, loose pages, no page numbering, no student name - Report handed in more than one day late - No references cited	- More than two errors. - Legible writing, some ill-formed letters, print too small or too large, wrong page numbering, papers stapled together. - Report handed in up to two hours late - References cited but only a few SCI	- Only one or two errors. - Legible writing, well-formed characters, clean and neatly bound in a report cover, illustrations provided - Report handed in up to one hour late - Mostly SCI references	- All grammar and spelling are correct - Word processed or typed, clean and neatly bound in a report cover, illustrations provided - Report handed in on time. - All SCI references	
				Total (max. 100)	