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JINNAH UNIVERSITY FOR WOMEN

Under the auspices of Quaid-é-Azam Muhammad Ali Jinnah

Pakistan's First Women University

Chartered by Sindh Provincial Assembly

Recognized by Higher Education Commission

Member INQAAHE

(International Network for Quality Assurance Agencies in Higher Education)

Department of Mathematics

Pre-requisite: MAT 4031/MAT 603: Biomathematics — Major IX

MAT 4222/MAT 622: Sport Mathematics (3 + 0) — Elective

Activity	Dates	Class and Activity Schedule
Teaching	July 9 - November 30	Mon, Tue 1055h–1145h; Thu 1055h–1235h
Mid-Term Test	Thursday, September 13	Room E-6, Mathematics
Data Sheet (filled out due)	Monday, October 22	Office: A-24 (Quality Enhancement Cell Rm.)
Obesity-Profile Calc. (part I due)	Monday, October 29	Office Hours: Mon, Tue, Thu 1330h–1420h
Obesity-Profile Calc. (part II due)	Monday, November 12	Telephone: 021 3662 0857-9 ext. 249
Terminal Examinations	December 6-30	e-mail: profdrakamal@gmail.com

Course Supervisor: **Professor Dr. Syed Arif Kamal**; PhD (Mathematical Neuroscience); MA (Johns Hopkins, United States); MS (Indiana, Bloomington, United States)

Course Objectives

To give the students a sound background in the techniques & the methods of sport mathematics so that they can apply these ideas to improve health of self and family, create a sport-friendly environment, work closely with sport professionals and enter graduate programs in sport and anthromathematics.

Higher Education and Job Opportunities

MS/MPhil/PhD from FUUAST, IBA, JUW, LUMS and University of Karachi. Jobs in health-care sector, R&D organizations, colleges and universities; would be a plus point for jobs in schools, hospitals and sport clubs, because the students get hands-on training in anthropometry, posture and gait analysis.

Course Outline — approved in Academic Council held on October 12, 2018

Unit A: Sport mathematics, history, definition and scope, role of mathematics in sport sciences and technologies

Unit B: Build of an adult and a child — mathematical expressions for small, medium and big build, significance of build in formation of sport teams and

classroom sections, computation of build from height and weight of an adult and a child

Unit C: Sport mathematics of the human spinal column — Static, dynamic and crystal-structure-based modeling, posture and gait of the athlete, athletes at risk for suffering from scoliosis

Unit D: Cardiac endurance of athlete — Modeling of heart as a deformed ellipsoid of revolution, cardiac coördinates, determination of heart size and shape by locating PMI (Points of Maximum Intensity) for sounds generated by pulmonary, tricuspid and mitral valves (geometry of heart-sound triangle)

Unit E: Significance of proper vision in athletic performance, mathematics of image formation, eye glasses and power of a lens, defects of vision, care of eyes; eclipse retinopathy and its prevention

Unit F: Fitness of athlete — Health-related fitness and skill-related fitness

Unit G: Growth charts and tables — CDC, WHO, extended and scaled (last two in detail)

Unit H: Over-coming vitamin-D deficiency in athletes, nutritional-status classification on the basis of Growth-and-Obesity Vector-Roadmap 2.1, computing severity of acute malnutrition using scaled percentiles

Recommended Reading

- De Mestre, N. (1990). *The Mathematics of Projectiles in Sport*. Australian Mathematical Society Lecture Series 6, Cambridge University Press, Cambridge, UK
- Eisen, M. (1988). *Mathematical Methods and Models in the Biological Sciences*, Prentice Hall, Englewood Cliffs, New Jersey, United States
- Haigh, J. (2009). Uses and limitations of mathematics in sport. *IMA Journal of Management Mathematics*, **20** (2): 97-108
- Heafner, J. W. H. (2005). *Modeling Biological Systems: Principles and Applications*, Springer, New York, United States
- Kamal, S. A. (2008, December 20-23). Role of mathematics in sports sciences and technologies. The Thirty-Fifth All Pakistan Science Conference (Genomics for Health and Prosperity), University of Karachi, Karachi, Pakistan, p. 75; *Karachi University Journal of Science*, **36** (1&2): 5, abstract#72: <http://www.ngds-ku.org/Presentations/Sports.pdf>
- Kamal S. A. (2014, May 17). Sports and anthromathematics. The Fifty-Fifth Annual Prize Distribution Function, Government College, Hyderabad, Pakistan (seminar), abstract: http://www.ngds-ku.org/Presentations/Sport_Mathematics.pdf
- Kamal, S. A. (2015, September 2). Research empowering teaching for community development: An example from sport-mathematics research. The Karachi University Second Educational Conference (Educational Issues in the Twenty-First Century), Faculty of Education, University of Karachi, Karachi, Pakistan, p. 1 (keynote lecture), abstract: <http://www.ngds-ku.org/Presentations/Research-Teaching-ComDev.pdf>
- Kamal, S. A. (2016, April 7). *Manual for Obtaining Anthropometric Measurements*, the NGDS Pilot Project e-Publication, Karachi, Pakistan, version 9.11, full text: http://www.ngds-ku.org/ngds_folder/M02.pdf
- Kamal, S. A. (2016). Pedagogical challenges and opportunities in sport and anthromathematics. *Journal of Education and Research*, **4**: 1-30, full text: <http://www.ngds-ku.org/Papers/J44.pdf>
- Keen, R. E. and J. D. Spain (1993). *Computer Simulation in Biology*, John Wiley, New York, United States
- Ruth, M. and B. Hannon (1997). *Modeling Dynamic Biological Systems*, Springer, New York, United States
- WHO Expert Committee Report (1995). *Physical Status: The Use and (the) Interpretation of Anthropometry*, WHO Technical Report Series 854, Geneva, Switzerland
- Williams, C. A., D. V. B. James & C. Wilson (2008). *Mathematics and Science for Exercise and Sport: The Basics*, Routledge, London, UK and New York, United States
- Schutz, R. W. (1980). Sport and mathematics: A definition and delineation. *Research Quarterly for Exercise and Sport*, **51** (1): 37-49 (measurement and research design)



Department of Mathematics
MAT 4222/MAT 622: Sport Mathematics • Course Flyer • Session 2018

Marks Breakdown

Evaluation Parameter	Marks
Terminal	60
Midterm	20
Assignment*	20
Total	100

*50% deduction of marks for late submission — absolutely **NO EXCUSES**. Part I — $P_{CDC}(h), P_{Scaled}(h), P_{CDC}(\mu), P_{Scaled}(\mu), P_{BMI}, STATUS_{\pm}^{MOD}(\mu)$, Descriptive Status (pertaining-to-mass), Build using scaled percentiles (1 *mark* each); Part II — 6 monthly recommendations of mass management (2 *marks* each); sample calculations: http://www.ngds-ku.org/M622/Project622/M_Family_Parents_622_18.pdf

Course Plan

Week	Dates	Lecture Topic
JULY 2018		
01	09, 10, 12	Introduction
02	16, 17	Solution of Terminal Paper (MAT 4031/MAT 621)
03	23	Course Policies
04	30, 31, 02 [#]	Units A & B
AUGUST 2018		
05	06, 07, 09	Unit C-1
06	13, 16	Unit C-1
07	20	Unit C-1
08	27, 28, 30	Unit C-2
SEPTEMBER 2018		
09	03, 04, 06	Unit C-2
10	10, 11, 13	Midterm Review (units A, B, C-1, C-2) + Solution of Sample Midterm Paper
11	17, 18	Midterm Exam + Unit C-3
12	24, 25, 27	Unit D-1
OCTOBER 2018		
13	01, 02, 04	Unit D-2 + Solution of Midterm Paper
14	08, 09, 11	Calculations of M Family Parents622
15	15, 16, 18	Unit E
16	22, 23, 25	Unit F
17	29, 30, 01 ^{&}	Unit G
NOVEMBER 2018		
18	05, 06, 08	Unit G
19	12, 13, 15	Unit H-1
20	19, 22	Unit H-2
21	26, 27, 29	Terminal Review + Solution of Sample Terminal Paper

[#]Falling in the month of August 2018

[&]Falling in the month of November 2018

Display of Results

Examination	Result • uploaded • updated • to be uploaded next • to be uploaded in due course
Midterm	http://www.ngds-ku.org/M622/Results622/Result_Midterm622_18.pdf
Retake	http://www.ngds-ku.org/M622/Results622/Result_Retake622_18.pdf
Terminal	http://www.ngds-ku.org/M622/Results622/Result_Consolidated622_18.pdf



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Required Reading

Unit	Required Reading • uploaded • updated • to be uploaded next • to be uploaded in due course
A	http://www.ngds-ku.org/M622/Handouts622/HandoutA_622_18.pdf http://www.ngds-ku.org/Papers/J44.pdf
B	http://www.ngds-ku.org/M622/Handouts622/HandoutB_622_18.pdf http://www.ngds-ku.org/Presentations/Research-Teaching-ComDev.pdf http://www.ngds-ku.org/Papers/J37.pdf
C	http://www.ngds-ku.org/M622/Handouts622/HandoutC-1_622_18.pdf http://www.ngds-ku.org/M622/Handouts622/HandoutC-2_622_18.pdf http://www.ngds-ku.org/M622/Handouts622/HandoutC-3_622_18.pdf http://www.ngds-ku.org/Articles/A14.pdf http://www.ngds-ku.org/Articles/A17.pdf http://www.ngds-ku.org/Papers/J18.pdf http://www.ngds-ku.org/Papers/J41.pdf
	http://www.ngds-ku.org/Articles/A16.pdf http://www.ngds-ku.org/Papers/J16.pdf http://www.ngds-ku.org/Papers/J36.pdf http://www.ngds-ku.org/Papers/J42.pdf
D	http://www.ngds-ku.org/M622/Handouts622/HandoutD-1_622_18.pdf http://www.ngds-ku.org/M622/Handouts622/HandoutD-2_622_18.pdf http://www.ngds-ku.org/Presentations/Heart.pdf http://www.ngds-ku.org/Papers/J25.pdf
	http://www.ngds-ku.org/Papers/J40.pdf
E	http://www.ngds-ku.org/M622/Handouts622/HandoutE_622_18.pdf http://www.ngds-ku.org/Papers/J51.pdf
F	http://www.ngds-ku.org/M622/Handouts622/HandoutF_622_18.pdf http://www.ngds-ku.org/Presentations/Fitness.pdf
G	http://www.ngds-ku.org/M622/Handouts622/HandoutG_622_18.pdf http://www.ngds-ku.org/Papers/J34.pdf
	http://www.ngds-ku.org/Papers/J48.pdf
H	http://www.ngds-ku.org/M622/Handouts622/HandoutH-1_622_18.pdf http://www.ngds-ku.org/M622/Handouts622/HandoutH-2_622_18.pdf http://www.ngds-ku.org/Papers/J50.pdf
	http://www.ngds-ku.org/Papers/J52.pdf

Sample-Paper Solutions

Examination	Solution • uploaded • updated • to be uploaded next • to be uploaded in due course
Midterm	http://www.ngds-ku.org/M622/Exams622/Solution_SampleM622_18.pdf
Terminal	http://www.ngds-ku.org/M622/Exams622/Solution_SampleT622_18.pdf

Actual-Paper Solutions

Examination	Solution • uploaded • updated • to be uploaded next • to be uploaded in due course
Midterm	http://www.ngds-ku.org/M622/Exams622/Solution_Midterm622_18.pdf
Retake	http://www.ngds-ku.org/M622/Exams622/Solution_Retake622_18.pdf
Terminal	http://www.ngds-ku.org/M622/Papers622/Solution_Terminal622_18.pdf

Handout Address: http://www.ngds-ku.org/M622/MAT4222-622_18.pdf

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