UNIVERSITY OF SOUTHERN MINDANAO

COURSE SYLLABUS for ITEM RESPONSE THEORY

Course Number	A MATH ELECT 01	Rev. No.	Ø	Page 1 of 11

EFFECTIVE DATE	REV. NO.	REVISION TYPE	CHANGE DESCRIPTION	PAGE AFFECTED	ORIGINATOR
August 05, 2022	Ø	New	Newly established in accordance to the Quality Management System Requirements	ALL	Anna Jean S. Garcia Jonald L. Pimentel

Author:	Reviewer:	Verifier:	Validator:	Final Approver:	DCC USE ONLY
JONALD L. PIMENTEL, PhD. ANNA JEAN S. GARCIA Faculty	JEANETH R. LICAROS, Ph.D. Department Curriculum Coordinator	LEONARD M. PALETA, Ph.D. Department Chairperson	JONALD L. PIMENTEL, Ph.D. Dean	GEOFFRAY R. ATOK, Ph.D. Vice President for Academic Affairs	DOCUMENT CONTROL INDICATOR MASTER 2022.08.05 COPY
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INSTITUTIONAL POLICIES	
Vision	Quality and relevant education for its clientele to be globally competitive, culture sensitive and morally responsive human resources for sustainable development.
Mission	Help accelerate socio-economic development[M1], promote harmony among the diverse cultures[M2] and improve quality of life[M3] through instruction, research, extension and resource generation in Southern Philippines.
Core Values	**G**-Goodness, **R**-Responsiveness, **E**-Excellence, **A**-Assertion of Right and **T**-Truth
USM Quality Policy Statement	The University of Southern Mindanao, as a premier university is committed to provide quality instruction, research development and extension services and resource generation that exceed stakeholders' expectations through the management of continual improvement efforts on the following initiatives. 1. Establish key result areas and performance indicators across all mandated functions. 2. Implement quality educational programs. 3. Guarantee competent educational service providers. 4. Spearhead need-based research outputs for commercialization, publication, patenting, and develop technologies for food security, climate change mitigation and improvement in the quality of life. 5. Facilitate transfer of technologies generated from research to the community for sustainable development. 6. Strengthen relationship with stakeholders. 7. Sustain good governance and culture sensitivity; and 8. Comply with customer, regulatory and statutory requirements.
Goals of the College	The College of Arts and Sciences pursues the development of well-rounded persons through a culture of excellence in the arts and sciences for the establishment of a just and humane society.
Department Objectives	The Department of Mathematics and Statistics aims to: 1. produce students with mastery in the core areas of mathematics and statistics, including algebra, analysis, and geometry; 2. develop students' skills in pattern recognition, generalization, abstraction, critical analysis, synthesis, problem-solving and rigorous argument; 3. express an enhanced perception of the vitality and importance of mathematics in the modern world including inter-relationships within math and its connection to other disciplines;and 4. develop students' skills in creating and evaluating mathematical conjectures and arguments, and in validating their own mathematical thinking.

PROGRAM INFORMATION					
Degree Program	**Bachelor of Science in Applied Mathematics**	CHED CMO Reference	**48 series of 2017**	BOR Approval	**BOR Res. No. 24, s 2020**

COURSE DETAILS					
Course Title	**Free Elective 1 – Item Response Theory**				
Course Number	**A MATH ELECT 01**		Curriculum Component	**(Curriculum Element C)**	
Credit (--Unit)	**3**	LECTURE (Unit-Hours)	**3-3**	LABORATORY (Unit-Hours)	**0-0**
Prerequisites	**None**	Co-requisites	**None**	Year Level/Semester Offered	**3rd Year / First Semester**
Course Description	This course offers introduction to linear regression, provides underlying assumptions and applications of the general linear model to education, biological science, economics and social sciences. The first part of the course discusses assumptions and application of simple linear regression, multiple linear regression, and general linear models. The consequences of violation and how to correct for violated assumptions will also be discussed. This course also includes logistic regression, cluster analysis and principal component analysis. The course will be taught using R, but students are welcome to use any statistical package of comfort.				
Faculty in charge					
Consultation Hours			Contact Information		

PROGRAM EDUCATIONAL OBJECTIVES (PEO)		MISSION		
In 3-5 years, the graduates of USM shall:		*M1*	*M2*	*M3*
PEO 1	Provide leadership in various development programs with public and private	✓		
PEO 2	Equip with technical, conceptual and human resource skills	✓		✓
PEO 3	Pursue entrepreneurial activities	✓		✓
PEO 4	Able to adapt to diverse culture		✓	
PEO 5	Pursue advanced studies in emerging related fields		✓	✓

NOTE: The PEO's are based on the professional, industry, local, national and international needs and requirements of the program identified through consultation with constituents and stakeholders.

PROGRAM OUTCOMES (PO) Upon graduation, the University of Southern Mindanao BSE Math students must be able to:	PEO1	PEO2	PEO3	PEO4	PEO5	PEO6	PEO7	PEO8	PEO9	PEO10	...
a) Articulate and discuss the latest development in the specific field of practice.		✓									
b) Effectively communicate orally and in writing using both English and Filipino		✓			✓						
c) Work effectively and independently in multidisciplinary and multi-cultural teams.			✓	✓							
d) Act in recognition of professional, social and ethical responsibility	✓										
e) Preserve and promote "Filipino historical and cultural heritage"				✓							
f) Participate in the generation of new knowledge in research and development projects.		✓									
g) Articulate the rootedness of education in philosophical, sociocultural, historical and psychological and political context.		✓									
h) Demonstrate mastery of subject matter/discipline		✓									
i) Facilitate learning using wide range of teaching methodologies and delivery modes appropriate to specific learners and their environment.		✓									
j) Develop innovative curricula, instructional plans, teaching approaches, and resources for diverse learners.		✓									
k) Apply skills in the development and utilization of ICT to promote quality, relevant and sustainable educational practices.		✓									
l) Demonstrate a variety of thinking skills in planning, monitoring, assessing and reporting learning processes and outcomes.		✓									
m) Practice professional and ethical teaching standards sensitive to the local, national, and global realities.	✓			✓							
n) Pursue lifelong learning for personal and professional growth through varied experiential and field-based opportunities.					✓						
o) Exhibit competence in mathematical concepts and procedures		✓									
p) Exhibit proficiency in relating mathematics to other curricular areas		✓									
q) Manifest meaningful and comprehensive pedagogical content knowledge (PCK)of mathematics		✓									
r) Demonstrate competence in designing, constructing, and utilizing different forms of assessment in mathematics		✓									
s) Demonstrate proficiency in problem-solving by solving and posing routine and non-routine problems with different levels of complexity.		✓									
t) Use effectively appropriate approaches, methods, and techniques in teaching mathematics including technological tools		✓									
u) Appreciate mathematics as an opportunity for creative work, moments of discovery, and gaining insight.		✓									

NOTE: Minimum PO's shall come from the PSG/CMO of the program if applicable. Other additional PO's may come from consultations with constituents and stakeholders.

COURSE OUTCOMES (CO)		PO[illegible]	PO[illegible]	POc	POd	POe	POf	POg	POh	POi	POj	POk	POl	POm	POn	POo	POp	POq	POr	POs	POt	POu	POv	POw	POx	POy	POz
Upon passing this course, the students must be able to:	**Course Alignment to Program Outcome**																										
CO 1	Differentiate the concepts of Classical Test Theory and Item Response Theory to Test Measurement							E	E	E								I									
CO 2	Know the concepts of different Unidimensional IRT Models							I		I		I						I	I								
CO 3	Apply to real data using IRT models with the help of free software, obtaining test Item characteristics parameter estimates.							I		I		I						I	I								
CO 4	Thoroughly able to digest the use of Rasch Model to real Data in Test Measurement and Construction							I	I	I		I						I	I								
CO 5	Able to know the different IRT Models for Polytomous Item response Data							I	I	I		I						I	I								

***Level** (follow the legend used in themost relevant PSG/CMO)*

[I]Introductory. This introduces the student to the Program Outcome (PO) [E]Enabling. This enab[illegible] the student to attain the Program Outcome (PO) [D]Demonstrative. This demonstrates the student's attainment of the Program Outcome (PO)

COURSE LEARNING PLAN

Intended Learning Outcomes (ILO) *By the end of the learning experience*, students must be able to:*	Aligned to CO:	Time Frame *(Week)*	Course Content *(Topics)*	Teaching & Learning Activities (TLA) Teaching Activities	Learning Activities	Learning Materials	Assessment Tasks (AT)	Suggested Readings
1.1 *Explain the vision, mission, UQPS of the University* **1.2** *Explain the goals and objectives of the college.* **1.3** *Explain the Program Educational Objectives, Students Outcomes , and Course Outcomes.*		1	**I. Orientation on Classroom and University Policies as well as Grading System** • Discussion on PEO, SO and CO	*Orientation Lecture/Discussion*	*Reading; Assignment*	*Computer; Chalkboard*	Recitation	[4] Pages 1-30
2.1 Understand the concepts of Classical Test Theory **2.2** Determine the Person Ability and Item Parameters in CTT	**CO1** **CO2**	2	**II. Classical Test Theory (CTT) I** • Definitions of CTT • Definitions of Person Ability and Item Parameters in CTT	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reflective paper	[1] Pages 5-7 [2] Pages 1-40 [3] Pages 1-8
3.1 Understand the concepts of Reliability and Item Estimates of CTT **3.2** Determine Item Characteristic Curve of CTT	**CO1** **CO2**	3	**III. Classical Test Theory (CTT) II** • Reliability and Item Estimates of CTT • Item Characteristic Curve of CTT	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reflective paper	[1] Pages 7-10 [2] Pages 41-50 [3] Pages 8-15
4.1 Understand the concepts of IRT **4.2** Determine the Person Ability and Item Parameters in IRT	**CO1** **CO2**	4	**IV. Item Response Theory (IRT) I** • Definitions of IRT • Definitions of Person Ability and Item Parameters in IRT	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reflective paper **SUMMATIVE EXAM 1**	[1] Pages 11-19 [2] Pages 81-128 [3] Pages 16-28
5.1 Understand the concepts of Reliability and Item Estimates of IRT **5.2** Determine the reliability of the test under IRT	**CO1** **CO2**	5	**V. Item Response Theory (IRT) II** • Reliability and Item Estimates of IRT • Item Characteristic Curve of IRT	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reflective paper	[1] Pages 11-19 [2] Pages 81-128 [3] Pages 16-28

COURSE LEARNING PLAN

Intended Learning Outcomes (ILO) *By the end of the learning experience*, students must be able to:*	Aligned to CO:	Time Frame *(Week)*	Course Content *(Topics)*	Teaching & Learning Activities (TLA) Teaching Activities	Learning Activities	Learning Materials	Assessment Tasks (AT)	Suggested Readings
6.1 Know the ICC of the logistic function, Rasch Model and One-parameter Logistic Model **6.2** Differentiate between the uses of logistic function, Rasch Model and One-parameter Logistic Model **6.3** Conduct and interpret a logistic function, Rasch Model and One-parameter Logistic Model on real data.	**CO1** **CO2**	**6**	**VI. Item Characteristic Curve Models I** • The Logistic Function • Introduction to Rasch, or One-Parameter Logistic Model	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper	[1] Pages 21-30 [2] Pages 157-200
7.1 Know the ICC of the The Two-Parameter Model and The Three-Parameter Model **7.2** Differentiate between the uses of The Two-Parameter Model and The Three-Parameter Model **7.3** Conduct and interpret The Two-Parameter Model and The Three-Parameter Model on real data.	**CO1** **CO2**	**7**	**VII. Item Characteristic Curve Models II** • The Two-Parameter Model • The Three-Parameter Model	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper	[1] Pages 31-40 [2] Pages 201-250
8.1 Understand the meaning of negative discrimination **8.2** Know the Guidelines for Interpreting Item Parameter Values	**CO1** **CO2**	**8**	**VIII. Item Characteristic Curve Models III** • Negative Discrimination • Guidelines for Interpreting Item Parameter Values	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper **SUMMATIVE EXAM 2**	[1] Pages 41-45 [2] Pages 251-285
All ILOs covered in Midterm		**9**	**Week 9: MIDTERM EXAMINATION**					

COURSE LEARNING PLAN

Intended Learning Outcomes (ILO) *By the end of the learning experience*, students must be able to:*	Aligned to CO:	Time Frame *(Week)*	Course Content *(Topics)*	Teaching & Learning Activities (TLA) Teaching Activities	Learning Activities	Learning Materials	Assessment Tasks (AT)	Suggested Readings
9.1 Estimates the item characteristics given the data using free software **9.2** Interpret the item parameter estimates	**CO_1** **CO_2**	**10**	**IX. Estimating Item Parameters I** • Estimating the item location • Estimating the item discrimination • Estimating the item guessing • Estimating the item trait score.	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper	[1] Pages 47-50 [2] Pages 42-50
10.1 Fit an Item Characteristic Curve to Response Data **10.2** Use a free computer software to fit an ICC given a real data.	**CO_1** **CO_2**	**11**	**X. Estimating Item Parameters I** • Procedures for Fitting an Item Characteristic Curve to Response Data • Use a computer software to fit an ICC	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper	[1] Pages 51-62 [2] Pages 51-58
11.1 Calibrate test items **11.2** Apply the Rasch Model to real dichotomous data in multiple choice test	**CO_3** **CO_4**	**12**	**XI. The Rasch Model for Dichotomous Items I** • Item calibration • Computation of a student's score	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper **SUMMATIVE EXAM 3**	[1] Pages 85-90 [2] Pages 305-320
12.1 Determine the response pattern of the persons given the test item results **12.2** Interpret the probability of getting the correct (or wrong) answer given the response pattern of the test items.	**CO_3** **CO_4**	**13**	**XII. The Rasch Model for Dichotomous Items II** • Computation of a student's score for incomplete designs • Optimal conditions for linking items	*Lecture/ Video Presentation/ Module*	*Discussion* *Seat work* *Group Reporting* *MyOpenMath Tasks* *Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper	[1] Pages 91-95 [2] Pages 321-380

COURSE LEARNING PLAN

Intended Learning Outcomes (ILO) *By the end of the learning experience*, students must be able to:*	Aligned to CO:	Time Frame *(Week)*	Course Content *(Topics)*	Teaching & Learning Activities (TLA) Teaching Activities	Learning Activities	Learning Materials	Assessment Tasks (AT)	Suggested Readings
13.1 Identify different Extension of the Rasch Model **13.2** Provide simple and accessible descriptions of the most commonly used Rasch models.		**14**	**XIII.The Rasch Model for Dichotomous Items III** • Extension of the Rasch Model • Applications of the extensions of Rasch Model	*Lecture/ Video Presentation/ Module*	*Discussion Seat work Group Reporting MyOpenMath Tasks Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper	[1] Pages 95-103 [2] Pages 381-400
14.1 Understand the concepts of Generalized Partial-Credit Model **14.2** Appy the Generalized Partial-Credit Model on real data	**CO3 CO4**	**15**	**XIV. Other Unidimensional Item Response Theory Models for Polytomous Data I** • Generalized Partial-Credit Model • Applications of Generalized Partial-Credit Model	*Lecture/ Video Presentation/ Module*	*Discussion Seat work Group Reporting MyOpenMath Tasks Khan Academy Tasks*	Chalkboard Book PDF Workbook Projector Laptop/PC	Quizzes Exams Seatworks Reports/ Reflective paper	[1] Pages 156-160 [3] Pages 401-483
15.1 Understand the concepts of Nominal Response Model **15.2** Apply Nominal Response Model on real data	**CO3 CO4**	**16**	**XV. Other Unidimensional Item Response Theory Models for Polytomous Data II** • Concepts of Nominal Response Model • Applications of Nominal Response Model				Quizzes Exams Seatworks Reports/ Reflective paper	[1] Pages 156-165 [3] Pages 39-60
16.1 Understand the concepts of Graded Response Model **16.2** Apply Graded Response Model on real data	**CO3 CO4**	**17**	**XVI. Other Unidimensional Item Response Theory Models for Polytomous Data III** • Concepts of the Graded Response Model • Applications of Graded Response Model				Quizzes Exams Seatworks Reports/ Reflective paper **SUMMATIVE EXAM 4**	[1] Pages 166-174 [3] Pages 61-103

COURSE LEARNING PLAN

Intended Learning Outcomes (ILO) *By the end of the learning experience*, students must be able to:*	Aligned to CO:	Time Frame *(Week)*	Course Content *(Topics)*	Teaching & Learning Activities (TLA) Teaching Activities	Learning Activities	Learning Materials	Assessment Tasks (AT)	Suggested Readings
All ILOs covered in the Course		**18**	**FINAL EXAMINATION**					

** any interaction, course, program, or other experience in which learning takes place (https://www.edglossary.org/learning-experience/).*

Textbook/References

[1] Baker, Frank B.2001. The Basics of Item Response Theory. ISBN 1-886047-03-0
[2] Steven P. Reise, Dennis A. Revicki.2015. Handbook of Item Response Theory Modeling. Applications to Typical Performance Assessment. ISBN 9781138787858
[3] Wim J. Linden & Ronald K. Hambleton. 1997. Handbook of Modern Item Response Theory. ISBN: 978-1-4757-2691-6
[4] USM Student Manual

Life-long Learning Opportunity

Course Evaluation

Course Outcomes (CO)	Assessment Task Addressing CO	Weight (%)	Satisfactory Rating	Target Standard
CO1: Discuss a broad overview of statistics and its applications in their field.	Quizzes/Summative Exams	20	75	60% of the class obtained a satisfactory rating
	Midterm Exam	40		
	Final Exam	40		
CO 2: Organize and present raw data in tables and interpret its result.	Quizzes/Summative Exams	20	75	60% of the class obtained a satisfactory rating
	Midterm Exam	40		
	Final Exam	40		
CO 3: Develop hypothesis-testing methodology as a technique for analyzing differences and making decisions.	Quizzes/Summative Exams	20	75	60% of the class obtained a satisfactory rating
	Midterm Exam	40		
	Final Exam	40		
CO 4: Use available statistical tools to arrange, analyze, and interpret	Quizzes/Summative Exams	20	75	60% of the class obtained a satisfactory rating
	Midterm Exam	40		

Course Evaluation

Course Outcomes (CO)	Assessment Task Addressing CO	Weight (%)	Satisfactory Rating	Target Standard
data.	Final Exam	40		
CO 5: Determine appropriate test designs for processing and managing numerical data.	Quizzes/Summative Exams	20	75	60% of the class obtained a satisfactory rating
	Midterm Exam	40		
	Final Exam	40		
CO 6: Interpret the statistical result in a way that addresses the question of interest.	Quizzes/Summative Exams	20	75	60% of the class obtained a satisfactory rating
	Midterm Exam	40		
	Final Exam	40		
	Quizzes/Summative Exams	20		
	Midterm Exam	40		

Grading System

Midterm Grade

Quizzes/Summative Exams----------30%
Assignments/Seat works/Group Reports----------30%
Midterm Exam---------- 40%

Final Term Grade

Final Grade

50% Midterm Grade+50% Final Term Grade

Passing Grade is 60%

Classroom Policies

a. Students who came late in three consecutive meetings are considered absent. Three consecutive absences equivalent to being dropped.
b. Students not in complete uniform shall not be allowed to attend the class.
c. Special exams shall only be administered within a maximum of three days after the conduct of exam with valid excuse letter noted by the college guidance counselor or medical certificate. No special quizzes shall be given.
d. Anyone who caught cheating or plagiarizing (in any form), both the cheater and the collaborator will get a failing grade in a subject. Knowledge is important. However, we will not neglect the values that the students need to possess. Honesty is a must and should be practiced in the class.
e. Students are required to participate in the laboratory activity. Absence or leaving early without valid reason would require that student to conduct the whole lab activity by himself/herself which will be scheduled thereafter but not conflicting with another scheduled lab activity.
f. A grade of INC shall be given only for those who passed the course but failed to conduct a lab activity and submit a lab report and/or other requirements before the deadline.
g. Students are not allowed to use cellphone or any gadgets for any activity unrelated to the class during lecture /laboratory session in entire duration.