# UNIVERSITY OF SOUTHERN MINDANAO

## COURSE SYLLABUS for Probability

| Course Number | Math 223c | Rev. No. | Ø | Page 1 of 9 |
|---|---|---|---|---|

| PEFFECTIVE DATE | REV. NO. | REVISION TYPE | CHANGE DESCRIPTION | PAGE AFFECTED | ORIGINATOR |
|---|---|---|---|---|---|
| January 24, 2022 | Ø | New | Newly established compressed syllabus for BS Applied Mathematics program for use during COVID-19 Pandemic. Flexible mode of instructions is adapted. | ALL | Leonard M. Paleta/Jonald L. Pimentel |



| Author: | Reviewer: | Verifier: | Validator: | Final Approver: | DCC USE ONLY |
|---|---|---|---|---|---|
| LEONARD M. PALETA, PhD<br>JONALD L. PIMENTEL, PhD<br>Course Developer | ANNA JEAN S. GARCIA, MAS<br>Subject Expert | JEANETH R. LICAROS, MA<br>Department Curriculum Coordinator | JONALD L. PIMENTEL, PhD<br>CSM Dean | GEOFFRAY R. ATOK, PhD<br>Vice President for Academic Affairs | DOCUMENT CONTROL INDICATOR<br>MASTER 2022.01.24 COPY |
| Date: 2021.12.13 | Date: 2021.12.15 | Date: 2021.12.17 | Date: 2021.12.20 | Date: 2022.01.24 | |

| 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.<br>1. Establish key result areas and performance indicators across all mandated functions;<br>2. Implement quality educational programs;<br>3. Guarantee competent educational service providers;<br>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;<br>5. Facilitate transfer of technologies generated from research to the community for sustainable development;<br>6. Strengthen relationship with stakeholders;<br>7. Sustain good governance and culture, sensitivity, and<br>8. Comply with customer, regulatory and statutory requirements. |
| *Goals of the College* | 1.The College of Science and Mathematics of the University of Southern Mindanao is committed to the comprehensive preparation of the next generation of scientists and mathematicians in this part of the country.<br>2.The College supplies a condition in which faculty can advance and support high-quality research programs in which students can collaborate and contribute to new knowledge that improves quality of life.<br>3.The College aspires to be the center of excellence in Science and Mathematics in order to serve diverse students, preparing them for their future careers in line with the vision and mission of the University.<br>4.The College serves the community and the industry as an impartial source of quality graduates in Science and Mathematics that provides education, literacy, innovation and solution generation to challenges. |
| *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 | Probability | | | | |
| Course Number | Math 223a | | | | |
| Credit (--Unit) | 3 Units | LECTURE (Unit-Hours) | 3 Units - 3 Hours | Curriculum Component | Major subject |
| Prerequisites | None | Co-requisites | None | LABORATORY (Unit-Hours) | 0 Units - 0 Hours |
| Course Description | This is an introductory course in probability covering axiomatic probability space, discrete and continuous random variables, special distributions, mathematical expectation, conditional probability and independence, multivariate distributions, Laws of Large Numbers, and the Central Limit Theorem. | | | Year Level/Semester Offered | 2nd - Second Semester |
| Faculty In charge | | | | | |
| Consultation Hours | | | Contact Information | | |

**PROGRAM EDUCATIONAL OBJECTIVES (PEO)**

| In 3-5 years, the **BS Applied Mathematics** graduates of USM shall: | | MISSION | | |
|---|---|---|---|---|
| | | M1 | M2 | M3 |
| PEO 1 | Provide leadership in various development programs both 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)<br>Upon graduation, the University of Southern Mindanao **BS Applied Mathematics** 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 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.) Gain mastery in the cores areas of mathematics: algebra, analysis, and geometry. | | ✓ | | | | | | | | | |
| r.) Demonstrate skills in pattern recognition, generalization, abstraction, critical analysis, synthesis, problem-solving and rigorous argument. | | ✓ | | | | | | | | | |
| s.) Develop 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. | | ✓ | | | | | | | | | |
| t.) Appreciate the concept and role of proof and reasoning and demonstrate knowledge in reading and writing mathematical proofs. | | ✓ | | | | | | | | | |
| u.) Make and evaluate mathematical conjectures and arguments and validate their own mathematical thinking. | | ✓ | | | | | | | | | |
| v.) Communicate mathematical ideas orally and in writing using clear and precise language. | | ✓ | | | | | | | | | |
| | | | ✓ | | | | | | | | |

*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) | | Course Alignment to Program Outcomes | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upon passing this course, the students must be able to: | | POa | POb | POc | POd | POe | POf | POg | POh | POi | POj | POk | POl | POm | POn | POo | POp | POq | POr | POs | POt | POu | POv |
| CO 1 | Define and discuss probability and random variables | I | | | | | | | | | | | | | | | E | | | E | E | E | E |
| CO 2 | Define, discuss and generate discrete and continuous probability distributions | I | | | | | | | | | | | | | | | E | | | E | E | E | E |
| CO 3 | Define, discuss and explore joint and marginal distributions | I | | | | | | | | | | | | | | | E | | | E | E | E | E |
| CO 4 | Define and discuss sampling distributions and laws of large numbers | I | | | | | | | | | | | | | | | E | | | E | E | E | E |

* ***Level** (follow the legend used in the most relevant PSG/CMO)*
[I] = Introductory. This introduces the student to the Program Outcome (PO). [E] = Enabling. This enables 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 | Teaching & Learning Activities (TLA) Learning Activities | Learning Materials | Assessment Tasks (AT) | Suggested Readings |
|---|---|---|---|---|---|---|---|---|
| **1.1** Explain the vision, mission, UQPS of the University<br>**1.2** Explain the goals and objectives of the college.<br>**1.3** Explain the Program Educational Objectives, Students Outcomes , and Course Outcomes. | | 1 | Orientation on Classroom and University Policies as well as Grading System<br>• Discussion on PEO, SO and CO | *Orientation Lecture/Discussion* | *Reading; Assignment* | *Computer;* | *Recitation* | *[1]* |
| **2.1** Write and define the basics terms of probability<br>**2.2** Determine the methods of assigning probabilities | **CO1** | 2 | **Basics of Probability**<br>• Sample spaces and events<br>• Methods of assigning probabilities<br>• Axiomatic approach to | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercises | [2] [3][4] [5][6][7]p.1-9 |

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| | | | probability | | Task | | | |
| 3.1 Calculate probabilities and conditional probability<br>3.2 Compute and understand independence and Baye's rule | | 3 | Calculating Probabilities and Baye's Rule<br>• Calculating Probabilities<br>• Conditional Probability and independence<br>• Baye's rule | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercise | [2][3][4] [5][6][7]p.10-14 |
| 4.1 Define a random variable<br>4.2Explain its usefulness in probabilities of events<br>4.3 Define distribution functions and give its properties | CO1 | 4 | Random Variables, Distribution Functions and Expectation<br>• Random Variables<br>• Distribution functions- definition and properties<br>• Discrete and continuous random variables<br>• Mathematical Expectation | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercise | [2][3][4] [5][6][7]p.15-23 |
| 5.1 Define and enumerate the discrete probability distributions<br>5.2 Determine its specific applications<br>5.3 Compute probabilities , means and variances of discrete probability distributions | CO2 | 5 | Discrete Probability Distribution<br>• Uniform<br>• Bernoulli/binomial<br>• Poisson<br>• Hypergeometric,<br>• and Negative binomial/geometric distributions | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercises | [2][3][4] [5][6][7]p.24-34 |
| 6.1 Define and enumerate the continuous probability distributions<br>6.2 Determine its specific applications<br>6.3 Compute probabilities , means and variances of continuous probability distributions | CO2 | 6-7 | Continuous Probability Distribution<br>• Uniform<br>• Normal/standard normal<br>• Gamma/exponential<br>• Beta<br>• Weibull<br>• Cauchy | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercises | [2][3][4] [5][6][7]p.35-41 |
| 7.1 Derive the distribution of a function of a random variables using different techniques<br>7.2Explain the notion of a random vector | CO2 | 8 | Functions of Random Variables<br>• Mathematical formulation<br>• Distribution of a function of a random variable-CGF technique, MGF technique, method of | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion, Board work, Seat work Group Reporting, USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercises | [2][3]p. 122-127 [4] [5][6][7] |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | transformations<br>• Expectation of functions of random variables | | | | | |
| **All ILOs covered in Midterm** | | **9** | **Midterm Examination** | | | | | |
| **8.1** Explain and give the properties of a joint cumulative distribution and joint probability distribution<br>**8.2** Derive conditional distributions and marginal distributions | **CO3** | **10-11** | Joint and Marginal Distributions<br>• The notion of a random a vector<br>• Joint distribution functions<br>• Marginal distributions | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion, Board work, Seat work Group Reporting, USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercises | [2]p. 85-108 [3][4] [5][6] [7] |
| **9.1** Explain and show independence of random variables<br>**9.2** Compute mathematical and conditional expectations involving functions of a random vector | **CO3** | **12-13** | Conditional Distribution and Stochastic Independence<br>• Conditional Distribution<br>• Stochastic Independence<br>• Mathematical Expectation | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion, Board work, Seat work Group Reporting, USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercises | [2]p. 109-151 [3][4] [5][6] [7] |
| **10.1** Construct sampling distributions<br>**10.2** Compute its means an variances | **CO3** | **14-15** | Sampling and Sampling Distributions | *Lecture/Video Presentation/addressing students questions Zoom video conference Module* | *Discussion, Board work, Seat work Group Reporting, USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercises | [2][3][4] [5][6] [7]p.58-74 |
| **11.1** Define and explain the Laws of Large Numbers<br>**11.2** Discuss the importance of Central Limit Theorem | **CO4** | **16-17** | Laws of Large Numbers and the Central Limit Theorem<br>• Laws of Large numbers<br>Central Limit Theorem | *Lecture/Video, Presentation/addressing students questions Zoom video conference, Module* | *Discussion, Board work, Seat work Group Reporting, USM VLE/ MyOpenMath Task* | Book\PDF Laptop/PC, Instructional Module | Assignments Quizzes Exams USM VLE Exercises | [2][3]p.128-129[4] [5][6] [7] |
| **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] USM Student Manual
[2] Hogg,R.V.,McKean, J.W. & Craig A.T.(2019) .*Introduction to Mathematical Statistics, 8th Ed.* Boston:Pearson.Available at: https://minerva.it.manchester.ac.uk/~saralees/statbook2.pdf
[3] Hsu,H.P. (1997). *Schaum's Outline on Theory and Problems of Probability, Random Variables, and Random Processes.*New York: McGraw Hill.
[4] Larsen, R.J. & Marx, M.L.(2018) *Introduction to Mathematical Statistics and Its Applications, 6th Ed.* Boston: Pearson. Available at: http://site.iugaza.edu.ps/mriffi/files/2019/09/textbook.pdf
[5] Mood,A.M., Graybill, F.A & Boes,D.C.(1963).*Introduction to the Theory of Statistics.*New York: McGraw Hill. Available at:

https://www.fulviofrisone.com/attachments/article/446/Introduction%20to%20the%20theory%20of%20statistics%20by%20MOOD.pdf
[6] Ross.S. (2019). *A first Course in Probability, 10th Ed.*Boston: Pearson.Available at:
https://github.com/Kikou1998/textbook/blob/master/A%20First%20Course%20in%20Probability%209th%20Edition.pdf
[7] Spiegel, H.,J.Schiller, and A. Srinivasan. (2001) *Schaum's Outline on Probability and Statistics.* New York: McGraw Hill.

**Life-long Learning Opportunity**

Apply basic probability concepts and theories in daily discourse. Apply appropriate probability concepts real-world situations and in coming up with relevant decisions such as in calculating probability or chances of winning,investment and economics, game theory, prediction and decision making,.

**Course Evaluation**

| Course Outcomes (CO) | Assessment Task Addressing CO | Weight (%) | Satisfactory Rating | Target Standard |
|---|---|---|---|---|
| CO 1: Define and discuss probability and random variables | Quizzes/Assignments/Others | 60 | 60 | 90% of the class obtained a satisfactory rating |
| | Major Exam | 40 | | |
| CO 2: Define, discuss and generate discrete and continuous probability distributions | Quizzes/Assignments/Others | 60 | 60 | 90% of the class obtained a satisfactory rating |
| | Major Exam | 40 | | |
| CO3: Define, discuss and explore joint and marginal distribution | Quizzes/Assignments/Others | 60 | 60 | 90% of the class obtained a satisfactory rating |
| | Major Exam | 40 | | |
| CO 4: Define and discuss sampling distributions and laws of large numbers | Quizzes/Assignments/Others | 60 | 60 | 90% of the class obtained a satisfactory rating |
| | Major Exam | 40 | | |
| | | | | |



**Grading System**

**Midterm Grade**

Quizzes----------40%
Assignments/Others----------30%
Midterm Exam----------30%

**Final Term Grade**

Quizzes/Summative Exams----------40%
Assignments/Others----------30%
Final Exam----------30%

**Final Grade**

50% Midterm Grade+50% Final Term Grade

**Passing Grade**

60%



**Classroom Policies**

1. Come to class prepared for recitation, class discussions, or unannounced quizzes always. Demonstrate personal responsibility by obtaining notes and finding out any instructions given on the class period missed.
2. Absence is not a right, nor a privilege. The University Code on absence and tardiness applies 20% of the total class hours means you are DROPPED from the course. Absences can be excused only after presenting official documents.
3. All submissions must be your original work. Cite sources properly. Plagiarism and any form of academic cheating get a corresponding grade of 5.0 (Failed) and can be grounds for suspension or expulsion.
4. During online class, students are expected to:
   a. Show up on a scheduled time and wait to be admitted into the class.
   b. Be always respectful. If your video is on, avoid hand gestures or inappropriate language.
   c. Stay on mute. Click a raise hand button if you have a question or something to share.
   d. Stay focused and on task so you don't miss anything the speaker says.
   e. Class participation is highly encouraged.
5. Consultation: You can approach your class mayor for your concerns so he/she will relay them once to your professor
6. All information and queries regarding our class will be posted in our official group chat or facebook group. Refrain from posting unrelated topics in these platforms as these will take up space in the messenger box and will make it difficult to backread important messages.
7. Observe proper decorum when sending messages to your professors.
8. Avoid sending messages online outside office hours or during evening.
9. All submissions must be in USM VLE. Submissions made outside VLE will not be accepted.