Republic of the Philippines
BOHOL ISLAND STATE UNIVERSITY
Magsija, Balilihan, 6342, Bohol, Philippines
Office of the College of Computing and Information Sciences
Balance | Integrity | Stewardship | Uprightness

COURSE SYLLABUS

Course Code	**CS ELEC 3**	Course Credits (Units)	Total:	**3**	Lecture	**2**	Lab	**1**
Course Title	**Graphics and Visual Computing**	Contact Hours/Week	Total:	**5**	Lecture	**2**	Lab	**3**
Prerequisite	**3rd Year Standing**	College / Department	**CCIS**					
Component	**Professional Course**	Semester, Academic Year	**First Semester, A.Y. 2025-2026**					
Program & Year	**BS in Computer Science 3**	Faculty	**Myrtlle Gem L. Oraño**					

Goals:	1. Pursue faculty and education excellence and strengthen the current viable curricular programs and develop curricular programs that are responsive to the demands of the times both in the industry and the environment. 2. Promote quality research outputs that respond to the needs of the local and national communities. 3. Develop communities through responsive extension programs. 4. Adopt efficient and profitable income generating projects/enterprise for self-sustainability. 5. Provide adequate, state-of-the-art and accessible infrastructure support facilities for quality equation. 6. Promote efficient and effective good governance supportive of high-quality education.
Core Values:	Balance, Integrity, Stewardship, and Rightness
Institutional Graduate Attributes:	
	Innovative and service-oriented professionals.
Program Educational Objective (PEO):	
	1. To provide students with technical and analytical skills in Information and Communications Technology through competence-based training. 2. To demonstrate the practice of ethical standards for IT professionals. 3. To produce research-oriented and competent information specialists for various sectors of society 4. To inculcate students' awareness on the involvement of IT in the preservation and protection of the environment.

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Program Outcomes: *(Based on your Program CMO)*
Program Outcomes (POs)
POs Common to all programs in all types of schools
PO 1: Articulate and discuss the latest developments in the specific field of practice. (PQF level 6 descriptor)
PO 2: Effectively communicate orally and in writing using both English and Filipino.
PO 3: Work effectively and independently in multi-disciplinary and multi-cultural teams. (PQF level 6 descriptor)
PO 4: Act in recognition of professional, social, and ethical responsibility.
PO 5: Preserve and promote “Filipino historical and cultural heritage” (based on RA 7722)
POs Common to the discipline
PO 6: Analyze complex problems, and identify and define the computing requirements needed to design an appropriate solution.
PO 7: Apply computing and other knowledge domains to address real-world problems.
PO 8: Design and develop computing solutions using a system-level perspective.
PO 9: Utilize modern computing tools.
Specific to BS Computer Science
PO 10: Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
PO 11: Identify, analyze, formulate, research literature, and solve complex computing problems and requirements reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.
PO 12: An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
PO 13: Knowledge and understanding of information security issues in relation to the design, development and use of information systems.
PO 14: Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PO 15: Create, select, adapt and apply appropriate techniques, resources and modern computing tools to complex computing activities, with an understanding of the limitations to accomplish a common goal.
PO 16: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

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PO 17: Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
PO 18: An ability to recognize the legal, social, ethical and professional issues involved in the utilization of computer technology and be guided by the adoption of appropriate professional, ethical and legal practices.
PO 19: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

Course Outcomes in Relation to Program Outcomes

Course Outcomes (COs) At the end of the course, the learners should be able to:	**Program Outcomes (POs)** (Legend: I – Introduced, E – Enabled, D – Demonstrated)			
	PO 10	**PO 11**	**PO 12**	**PO 14**
CO1. Utilize Python to implement fundamental 2D graphics concepts and image filtering techniques.	D	D	E	I
CO2. Apply 3D coordinate systems and projections to create and render 3D scenes.	D	D	I	I
CO3. Apply basic shading and lighting techniques to create visually realistic 3D scenes.	I	I	I	I
CO4. Implement machine learning and deep learning algorithms to solve computer vision problems.	D	D	E	I

Legend:
I – Introduced – An introductory course to an outcome; E – Enabled - A course that strengthens the outcome; D – Demonstrated – A course demonstrating an outcome

Course Description:	This course provides an in-depth understanding of graphics and visual computing, utilizing Python and its built-in libraries. Through projects, assignments, and real-world application, students will gain knowledge in computer graphics, image processing, computer vision, and theoretical and conceptual frameworks.

Course Outcome	Learning Objectives	Content/Course Matter	Time Frame	Teaching and Learning Activities	Assessment Tasks	Remarks
	By the end of the week, the students are expected to: ➢ Understand the scope and objectives of the course.	**Overview** • Course Introduction • Course Syllabus Discussion • Class Policies	WEEK 1	• Course Syllabus • Lecture/ Discussion	✓ Diagnostic Exam/Pretest ✓ Assignment 1	

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	➢ Understand the course schedule, grading system, required materials, and major assessments, enhancing their academic preparedness and planning.					
	By the end of the week, the students are expected to: ➢ Review of data types, control flow, functions, and object-oriented programming.	**Introduction to Python for Graphics (Part 1)** • Python Basics Refresher	WEEK 2	• Lecture/ Discussion	✓ Quiz 1 ✓ Activity 1 ✓ Assignment 2	
	By the end of the week, the students are expected to: ➢ Understand image, pixel data, and array manipulation using NumPy. ➢ Demonstrate techniques in creating 2D and 3D plotting for basic visualization.	**Introduction to Python for Graphics (Part 2)** • Basic Image Manipulation with PIL/Pillow • Visualizing Data with Matplotlib	WEEK 3	• Lecture/ Discussion • Laboratory Exercise 1 Announcement	✓ Quiz 2 ✓ Laboratory Exercise 1 Announcement ✓ Assignment 3	
	By the end of the week, the students are expected to: ➢ Understand the basics of computer graphics and visual computing. ➢ Recognize the key historical milestones in the field. ➢ Identify current applications in various industries.	**Foundations of Graphics & Visual Computing** • Overview of Computer Graphics • History and Evolution • Applications for Modern Computing	WEEK 4	• Lecture/ Discussion • Laboratory Exercise 1	✓ Quiz 3 ✓ Laboratory Exercise 1 ✓ Assignment 4	

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	By the end of the week, the students are expected to: ➢ Implement Python code to create 2D geometric shapes, demonstrating a basic understanding of coordinate systems. ➢ Apply and combine 2D geometric transformations with graphic objects using Python.	**2D Core Graphics Concepts** • Drawing Primitives and Shapes • Geometric Transformations (2D)	WEEK 5	• Lecture/ Discussion	✓ Quiz 4 ✓ Activity 2 ✓ Assignment 5	
	By the end of the week, the students are expected to: ➢ Understand the concepts of convolution and correlation techniques. ➢ Understand basic noise reduction techniques to improve image quality in Python.	**Image Filtering and Enhancement** • Convolution and Kernels • Noise Reduction Techniques	WEEK 6	• Lecture/ Discussion • Laboratory Exercise 2 Announcement	✓ Quiz 5 ✓ Laboratory Exercise 2 Announcement ✓ Assignment 6	
	By the end of the week, the students are expected to: ➢ Define and represent points and vectors in 3D space and perform basic vector operations using Python. ➢ Understand 3D translation, scaling, and rotation using transformation matrices in Python. ➢ Utilize a basic Python 3D graphics library to render	**3D Coordinate Systems and Transformations** • Understanding 3D Space, Points, Vectors • 3D Translation, Scaling, Rotation Matrices • Introduction to Basic 3D Libraries	WEEK 7	• Lecture/ Discussion • Laboratory Exercise 2	✓ Quiz 6 ✓ Laboratory Exercise 2 ✓ Assignment 7	

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	simple 3D scenes and objects.					
	By the end of the week, the students are expected to: ➢ Understand the difference between orthographic and perspective projections. ➢ Understand viewing transformations to position and orient a virtual camera in a 3D scene.	**Projections and Camera Model** • Orthographic and Perspective Projections • Viewing Transformations	WEEK 8	• Lecture/ Discussion	✓ Quiz 7 ✓ Assignment 8	
	By the end of the week, the students are expected to: ➢ Discover the science behind light and perception in imaging.	**Basic Shading and Lighting** • Ambient, Diffuse, Specular Lighting • Introduction to Simple Light Sources	WEEK 9	• Lecture/ Discussion	✓ Quiz 8 ✓ Assignment 9	
MIDTERM EXAMINATION (WEEK 10)						
	By the end of the week, the students are expected to: ➢ Understand fundamental image segmentation techniques to isolate objects or regions within an image. ➢ Identify and describe key features (e.g., corners, edges) in images. ➢ Implement basic object detection methods in images using Python.	**Advanced Image Processing and Computer Vision Fundamentals** • Image Segmentation • Feature Detection and Description • Object Detection Fundamentals	WEEK 11	• Lecture/ Discussion • Laboratory Exercise 3 Announcement	✓ Quiz 9 ✓ Laboratory Exercise 3 Announcement ✓ Assignment 10	

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	By the end of the week, the students are expected to: ➢ Develop simple interactive graphical applications using Pygame or Pyglet in Python.	**Real-time and Interactive Graphics** • Introduction to Pygame/Pyglet for Interactive Applications	WEEK 12	• Lecture/ Discussion • Laboratory Exercise 3	✓ Quiz 10 ✓ Laboratory Exercise 2 ✓ Assignment 11	
	By the end of the week, the students are expected to: ➢ Differentiate between supervised and unsupervised learning paradigms in machine learning. ➢ Identify and apply basic regression and classification concepts.	**Introduction to Machine Learning Concepts (Part 1)** • Supervised vs. Unsupervised Learning • Regression and Classification basics	WEEK 13	• Lecture/ Discussion	✓ Quiz 11 ✓ Assignment 12	
	By the end of the week, the students are expected to: ➢ Split datasets into training, validation, and testing sets for machine learning model development. ➢ Implement and train simple machine learning models using scikit-learn for basic tasks.	**Introduction to Machine Learning Concepts (Part 2)** • Training, validation, and testing data • Introduction to scikit-learn for simple ML models	WEEK 14	• Lecture/ Discussion • Laboratory Exercise 4 Announcement	✓ Quiz 12 ✓ Laboratory Exercise 4 Announcement ✓ Assignment 13	
	By the end of the week, the students are expected to: ➢ Explain the basic architecture and function of	**Deep Learning Fundamentals (Part 1)** • Neural Networks (perceptrons, multi-layer perceptrons) • Introduction to Convolutional Neural Networks (CNNs)	WEEK 15	• Lecture/ Discussion • Laboratory Exercise 4	✓ Quiz 13 ✓ Laboratory Exercise 4 ✓ Assignment 14	

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	perceptrons and multi-layer perceptrons. ➢ Describe the core concepts and purpose of Convolutional Neural Networks (CNNs) in image processing.					
	By the end of the week, the students are expected to: ➢ Identify and explain the roles of convolutional, pooling, and fully connected layers within a CNN architecture. ➢ Implement and train a basic Convolutional Neural Network (CNN) using TensorFlow/Keras or PyTorch.	**Deep Learning Fundamentals (Part 2)** • Convolutional, Pooling, Fully Connected • Using TensorFlow/Keras or PyTorch for basic CNN implementation	WEEK 16	• Lecture/ Discussion	✓ Quiz 14 ✓ Assignment 15	
	By the end of the week, the students are expected to: ➢ Analyze and critically evaluate key concepts and theories discussed in the course, demonstrating a comprehensive understanding of the subject matter.	**Written Final Examination**	WEEK 17	• Final Written Examination • Final Project Consultation	✓ Final Written Examination	
FINAL PITCH PRESENTATION (WEEK 18)						

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References:	Campbell, J., Gries, P., Montojo, J., & Wilson, G. (2009). *Practical Programming: An introduction to computer science using Python*. http://ndl.ethernet.edu.et/bitstream/123456789/54569/1/1.pdf.pdf Heaton, J. (2017). Ian Goodfellow, Yoshua Bengio, and Aaron Courville: Deep learning. *Genetic Programming and Evolvable Machines*, *19*(1–2), 305–307. https://doi.org/10.1007/s10710-017-9314-z Mohri, M., Rostamizadeh, A., & Talwalkar, A. (2012). *Foundations of machine learning*. http://ci.nii.ac.jp/ncid/BB10313921 Szeliski, R. (2022). *Computer Vision: Algorithms and Applications* (2nd ed.). Springer. Retrieved from https://szeliski.org/Book/ *Other Supplementary Materials,* details will be given in each learning material guides.
Integration of Values:	Patience, appreciation, diligence, precision and accuracy, self-confidence, hard work, honesty, determination, discipline, perseverance, time management, independence, optimism, persistence, neatness and orderliness
Grading System:	50% passing mark/transmutation of raw scores or cumulative related scores Major Examinations 30 % Major Outcome-Based Projects (performance/practicum) 30 % Class Works and Participation (Quizzes, Assignments, Attendance) 40 % TOTAL 100 %

Classroom Policies:	• Attendance is recorded (excerpt from Student Handbook).
	• During scheduled online classes, learning materials will be provided for self-paced study. Virtual classes will only be conducted if announced in advance.
	• Students are expected to meet all deadlines for assignments and projects.
	• Rules to follow during laboratory exercises:
	  ○ Presentations/defenses for laboratory exercises will be held one week after their announcement.
	  ○ A deduction of 2 points will be applied for each week a laboratory exercise submission is delayed.
	  ○ **FAILURE TO DEFEND** will result in a score of 0 for that laboratory exercise.
	• No make-up quizzes or assignments will be provided for missed ones, unless stated otherwise.
	• Special exams may be granted for valid reasons upon the submission of a letter explaining the circumstances.
	• Other policies may be established and agreed upon during the first day of classes.

Designed by:

MYRTLLE GEM L. ORAÑO
Instructor 1

Reviewed by:

CATHERINE LEAH G. GABO, MEng
Chairperson, CIS

Approved:

SHELLA C. OLAGUIR, PhD
Dean, CCIS

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PROJECTS/ACTIVITIES RUBRICS

LABORATORY EXERCISES CRITERIA

Table 1. Laboratory Exercise Criteria

CRITERIA	EXCELLENT	PROFICIENT	SATISFACTORY	NEEDS IMPROVEMENT	UNSATISFACTORY
Functionality	**15 pts:** *The code produces the expected results and covers all required features and tasks.*	**12 pts:** *Has minor issues, mostly correct results, and covers most features.*	**9 pts:** *Some features were missing or buggy, but core functionality works.*	**6 pts:** *Major features were missing or incorrect results.*	**3 pts:** *The code fails to run or does not meet requirements.*
Code Understanding	**10 pts:** *An in-depth understanding of the code was observed, with no errors about the code's functionality and overall performance.*	**8 pts:** *Shows good knowledge of the code, with minor errors and gaps in the explanation.*	**6 pts:** *Understands the code but misses key details or has unclear explanation.*	**4 pts:** *Shows limited understanding, which raises the question of code originality and ownership.*	**2 pts:** *Failed to demonstrate understanding, leading to questions on students' credibility and code ownership.*
Code Quality	**10 pts:** *The code is optimized and efficient in its execution and is readable.*	**8 pts:** *Mostly efficient and readable, with minor improvements needed.*	**6 pts:** *Has acceptable readability, with some inefficiencies.*	**4 pts:** *Has poor readability or inefficient logic.*	**2 pts:** *Unreadable or highly inefficient code.*
Originality	**5 pts:** *The code is original and follows a distinct flow that is unique to the pair's approach to the problem.*	**4 pts:** *Some originality, mostly logical.*	**3 pts:** *Standard approach, minimal creativity.*	**2 pts:** *Predictable and disorganized.*	**1 pt:** *No originality or clear flow.*
Comments	**5 pts:** *The code is well-commented and easy to understand.*	**4 pts:** *Mostly clear with some comments.*	**3 pts:** *Basic comments, some unclear parts.*	**2 pts:** *Sparse or unclear comments.*	**1 pt:** *No comments or confusing code.*
Collaboration & Teamwork	**5 pts:** *The defense is clear, engaging, and well-structured, showcasing effective collaboration and teamwork.*	**4 pts:** *Mostly clear and collaborative.*	**3 pts:** *Adequate but lacks engagement or structure.*	**2 pts:** *Disorganized or unclear defense.*	**1 pt:** *No defense or poor teamwork.*
TOTAL					**50 POINTS**

ACTIVITY CRITERIA

Table 2. Activity Criteria

COMPONENT	DESCRIPTION	POINTS
Objective Alignment		**10 POINTS**

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Clear Objectives	The activity's objectives are clearly stated and easy to understand.	5 points
Relevance to Learning Goals	The activity directly supports and enhances the learning objectives.	5 points
Content Quality		**15 POINTS**
Accuracy	The information provided is accurate and reliable.	5 points
Depth	The content is thorough and covers the topic comprehensively.	5 points
Relevance	The content is highly relevant to the topic and objectives.	5 points
Use of Tools/Resources		**10 POINTS**
Effective Usage	Tools and resources are used effectively to enhance the learning experience.	5 points
Appropriateness	The chosen tools and resources are appropriate for the activity and audience.	5 points
Creativity and Originality		**15 POINTS**
Creativity	The activity shows creativity and innovative approaches.	5 points
Engagement	The activity is engaging and captures participants' interest.	5 points
Originality	The activity is original and demonstrates unique ideas.	5 points
TOTAL		**50 POINTS**

FINAL PROJECT/EXAM CRITERIA

Table 3. Output Grading Criteria

COMPONENT	DESCRIPTION	POINTS
Project Proposal		**20 POINTS**
Clarity and Objectives	The project proposal is clear and well-defined with specific objectives.	10 points
Feasibility	The project is feasible within the given time frame and resources.	10 points
Code Implementation		**40 POINTS**
Code Quality	The code is well-formatted and logically organized.	20 points
Functionality	The code meets the project requirements and produces correct results.	20 points
Code Quality		**20 POINTS**
Efficiency	The code is optimized and efficient in its execution.	10 points
Readability	The code is readable and well-formatted.	10 points
Presentation	The project presentation is clear, engaging, and well-organized.	**10 POINTS**
Testing and Validation		**10 POINTS**
Testing Coverage	The code has been thoroughly tested with sufficient test cases.	5 points
Validation	The code handles edge cases and potential errors gracefully.	5 points
TOTAL		**100 POINTS**

Table 4. Pitching Criteria

COMPONENT	DESCRIPTION	POINTS

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Content Quality		**25 POINTS**
Relevance of information	Ensures content aligns with the purpose of the website.	10 points
Clarity and grammar	Maintains proper grammar and clear communication.	10 points
Creativity in presentation	Delivers innovative and engaging storytelling or ideas.	5 points
Design and UX		**20 POINTS**
Aesthetic design	Combines color, typography, and visuals effectively.	10 points
Ease of navigation	Provides seamless and intuitive user experience.	10 points
Functionality		**15 POINTS**
Efficiency	The website produces the expected results with minimal to no errors.	10 points
Loading speed	Smooth navigation and responsive features.	5 points
Delivery of Pitch		**20 POINTS**
Clear diction and flow	Confidence, clarity, and overall presentation skills.	10 points
Effective time management	Presents information efficiently within the given time.	10 points
Audience Impact		**20 POINTS**
Emotional resonance	Strikes a deep connection with the audience emotionally.	10 points
Persuasiveness	Demonstrates compelling and convincing arguments.	10 points
TOTAL		**100 POINTS**

Table 5. QnA Grading Criteria

COMPONENT	DESCRIPTION	POINTS
Response Quality	Each student answered well and comprehensively during the Q&A session.	**10 POINTS**
Understanding of the Code	Each student demonstrated a clear understanding of their code and project.	**10 POINTS**
TOTAL		**20 POINTS**

Table 6. Overall Grading Conversion

Components	Scores
Output Grading	100
Pitching	100
QnA	20
Total	220
Equivalent	**100 points**