



Republic of the Philippines  
**Laguna State Polytechnic University**  
Province of Laguna

**College of Computer Studies**

**I. UNIVERSITY**

**VISION:** The Laguna State Polytechnic University is a center of sustainable development initiatives transforming lives and communities.

**MISSION:** LSPU provides quality education through responsive instruction, distinctive research, sustainable extension, and production services for improved quality of life.

**QUALITY POLICY** LSPU delivers quality education through responsive instruction, distinctive research, sustainable extension, and production services. Thus, we are committed with continual improvement to meet applicable requirements to provide quality, efficient and effective services to the university stakeholders' highest level of satisfaction through an excellent management system imbued with utmost integrity, professionalism, and innovation.

**AN OUTCOMES-BASED LEARNING PROGRAM (Syllabus)**

Program: BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Course Title: CST106 – Perception and Computer Vision

Pre-Requisites: \_\_\_\_\_

Academic Year: 2023-2024

Semester: 2nd Summer: \_\_\_\_\_

No. of Units: 3 No. of Hours: 54

**Part 1. Course Description**

This course offers an in-depth exploration of computer vision and perception systems, focusing on the fundamental techniques used to process, analyze, and understand visual information from the world. Students will learn to implement key computer vision algorithms and methods, such as image processing, feature extraction, object detection, image segmentation, motion analysis, and 3D vision, using Python and popular libraries like OpenCV, TensorFlow, and PyTorch. The course emphasizes practical application, with hands-on exercises and projects that enable students to develop and refine their technical skills. By the end of the course, students will be equipped to design, develop, and evaluate computer vision systems, preparing them for advanced studies or careers in fields that require strong competencies in artificial intelligence and visual data analysis.

## Part 2. Outcomes-based Macro Curriculum Framework

Intended Learning Outcomes (ILOS)				
Institutional (ILOs)		Program Intended Learning Outcomes		Course Intended Learning Outcomes
LSPU Students Attributes An LSPU CCS student is expected to be a:		When you have fully completed the CCST-106 you should be a student who:		When you have fully completed CCST-106 you should be able to:
INTEGRITY	1. <b>Responsible and Upright Citizen</b> , who is capable of achieving high level personal well-being contributive to the harmony and betterment of the profession, family, society and nation.	<b>CSO1:</b> Demonstrate an understanding of key computer vision concepts and apply these concepts ethically in real-world applications.  <b>CSO2:</b> Apply computer vision techniques to solve complex problems in diverse fields while considering social, ethical, and professional responsibilities.  <b>CSO3:</b> Demonstrate proficiency in the use of programming languages and software tools for developing computer vision systems.  <b>CSO4:</b> Communicate technical information effectively, both orally and in writing, to a range of audiences including non-specialists.		<b>CILO1:</b> Explain and describe the fundamental concepts and techniques in computer vision, including image processing and feature extraction.  <b>CILO2:</b> Utilize computer vision tools (e.g., OpenCV, TensorFlow, PyTorch) to implement and evaluate object detection, image segmentation, and motion analysis techniques.
	2. <b>Compassionate Leader</b> , who is an advocate of good governance and quality management for a quality life.			<b>CILO3:</b> Develop and present a comprehensive project that integrates various computer vision techniques to address a specific problem.
PROFESSIONALISM	3. <b>Professionally Skilled</b> , who applies technological as worker-leader in the field of expertise apt to the global needs.			<b>CILO4:</b> Collaborate effectively in teams to design, implement, and troubleshoot computer vision systems using Python and relevant libraries.
	4. <b>Effective Communicator</b> , who is proficient in the exchange of information orally and in writing both in English and in Filipino in interpreting, expressing and negotiating meanings in relevant settings for lifelong learning.			<b>CILO5:</b> Critically evaluate the performance of

INNOVATION	5. <b>Creative &amp; Critical Thinker</b> , who articulates and produces entrepreneurial resources extended to families and community for improvement.		computer vision algorithms and suggest improvements based on the application context.  <b>CILO6:</b> Communicate findings and technical details of computer vision projects through well-structured reports and presentations.
	6. <b>Competent Research Oriented Individual</b> , who is able to analyze facts methodically, discover and establish new theory to use in solving problems and decision-making contributory to the sustainability of the needs of the community.		

### Part 3. Curriculum Mapping

		Program Outcomes									
		CS01	CS02	CS03	CS04	CS05	CS06	CS07	CS08	CS09	CS10
CMSC 101	Computer Science Fundamentals	I	I	I	I	I	I	I	I	I	I
CMSC 102	Computer Programming 1	I	E	E	E	E	E	D	D	E	E
CMSC 103	Computer Programming 2	I	E	E	E	E	E	D	D	E	E
CMSC 201	Data Structures	I	E	E	E	E	E	D	D	E	D
CMSC 202	Object Oriented Programming	I	E	E	E	E	E	D	D	D	D
CMSC 203	Design and Analysis of Algorithm	I	E	E	E	E	E	D	E	D	D
CMSC 104	Discrete Structures	I	I	I	I	I	I	E	E	E	E
SMBUSCO	Business Communication	E	E	E	E	E	E	E	E	E	E
CMSC 205	Database Management Systems	I	E	E	D	D	D	D	D	D	D
CMSC 206	Programming Languages	E	E	E	D	D	D	D	D	D	D
CMSC 207	Automata and Language Theory	I	E	E	E	E	E	E	E	E	E
CMSC 208	Logic Design and Digital Computer Circuits	I	E	E	E	E	E	E	E	E	E
SMSVCCU	Service Culture	E	E	E	E	E	E	E	E	E	E
CMSC 209	Web Programming	I	E	E	D	D	D	D	D	D	D
CMSC 210	Modeling and Simulation	E	E	E	E	E	E	D	E	E	E
CMSC 105	Computer Organization and Assembly Language	E	E	E	D	E	E	D	D	D	D
SMFBPO1	Fundamentals of Business Process Outsourcing 101	E	E	E	E	E	E	E	E	E	E
CMSC 211	Software Engineering	E	E	E	E	D	D	D	D	D	D
CMSC 212	Operating System	E	E	E	E	D	D	D	D	D	D
SMSYSTH	Principles of Systems Thinking	E	E	E	E	E	E	E	E	E	E
CMSC 501	Undergraduate Thesis 1	D	D	D	D	D	D	D	D	D	D
CMSC 502	Undergraduate Thesis 2	D	D	D	D	D	D	D	D	D	D
CSMC 411	Network and Internet Technology	E	E	E	E	E	D	D	D	D	D
SMFBPO2	Fundamentals of Business Process Outsourcing 102	E	E	E	E	E	E	E	E	E	E
CMSC 103	Practicum Internship	D	D	D	D	D	D	D	D	D	D

Legend:

I – Introductory Course

E – Enabling Course

D – Demonstrative Course

#### Part 4. Teaching and Learning Matrix

WEEK	Intended Learning Outcomes (ILOs)	Course Contents	Teaching-Learning Activities	Assessment Tasks
1-2	CILO1, CILO4	<b>Course Orientation</b>  <b><u>Module 1.0: Introduction to Computer Vision and Image Processing.</u></b>  <b>Topic 1.1: Overview of the Course</b> <ul style="list-style-type: none"> <li>- Overview of Course</li> <li>- Setting up Python, OpenCV, TensorFlow, PyTorch</li> <li>- Basics of Computer Vision</li> <li>- Applications of Computer Vision</li> </ul>	<ul style="list-style-type: none"> <li>- Lecture on course expectations and objectives</li> <li>- Group discussion on computer vision applications</li> <li>- Practical setup of Python and required libraries</li> </ul>	<ul style="list-style-type: none"> <li>- Quiz on course basics</li> <li>- Participation in group discussion</li> <li>- Environment setup verification</li> </ul>
3-5	CILO1, CILO2	<b>Topic 1.2: Image Processing Techniques</b> <ul style="list-style-type: none"> <li>- Image transformations: scaling, rotation</li> <li>- Filtering techniques: blurring, edge detection</li> </ul>	<ul style="list-style-type: none"> <li>- Lecture on image processing concepts</li> <li>- Hands-on lab: Applying transformations and filters to images using OpenCV</li> <li>- Problem-solving session for common image processing tasks</li> </ul>	<ul style="list-style-type: none"> <li>- Assignment: Implement image transformations and filtering</li> <li>- Lab work: Submitting processed images</li> </ul>
6	CILO1, CILO3	<b><u>Module 2.0: Feature Extraction and Object Detection</u></b>  <b>Topic 2.1: Feature Extraction Methods</b> <ul style="list-style-type: none"> <li>- SIFT, SURF, ORB</li> <li>- Feature matching and applications.</li> </ul>	<ul style="list-style-type: none"> <li>- Lecture on feature extraction and matching algorithms</li> <li>- Hands-on lab: Extracting features using OpenCV</li> <li>- Problem-solving session on matching features between images</li> </ul>	<ul style="list-style-type: none"> <li>- Assignment: Feature extraction and matching tasks</li> <li>- Lab work: Comparing feature extraction results</li> </ul>
7-9	CILO2, CILO5	<b>Topic 2.2: Object Detection and Recognition</b> <ul style="list-style-type: none"> <li>- Object detection methods: HOG, SVM, YOLO, SSD</li> </ul>	<ul style="list-style-type: none"> <li>- Lecture on object detection algorithms</li> <li>- Hands-on lab: Implementing object detection using TensorFlow</li> </ul>	<ul style="list-style-type: none"> <li>- Mid-term project: Implementing object detection on a dataset</li> <li>- Presentation of initial project results</li> </ul>

			- Interactive session: Comparing traditional vs. deep learning approaches	
10		<b>MIDTERM EXAMINATION</b>		
11-12	CILO2, CILO3	<b><u>Module 3.0: Image Segmentation, Motion Analysis, and 3D Vision.</u></b>  <b>Topic 3.1: Image Segmentation and Motion Analysis</b> - Thresholding, clustering - Motion analysis techniques	- Lecture on image segmentation techniques - Hands-on lab: Segmenting images using different methods - Problem-solving session on motion tracking in videos	- Quiz on segmentation and motion analysis - Case study: Applying segmentation and motion tracking to a real-world problem
13-14	CILO3, CILO4	<b>Topic 3.1 3D Vision and Depth Perception</b> - Stereo vision, depth maps - 3D reconstruction techniques	- Lecture on 3D vision concepts - Hands-on lab: Building depth maps and reconstructing 3D scenes using OpenCV - Interactive session: Applications of 3D vision in industry	- Assignment: Creating depth maps and 3D reconstructions - Lab work: Evaluating 3D vision techniques
15	CILO4, CILO5	<b>Module 4.0: Integration, Applications, and Final Project Development.</b>  <b>Topic 4.1: Integration and Applications</b> - Combining techniques for complex tasks - Real-world applications.	- Group project work: Developing a comprehensive vision system using multiple techniques - Case study discussions on industry applications	- Group project: Developing and presenting a complex vision system - Peer review and feedback on project progress
16	CILO5, CILO6	<b>Topic 4.2: Final Project Development</b> - Final project guidelines - Project review and refinement  <b>Topic 4.3: Course Review</b> - Review of key concepts - Preparation for final project presentations	- Final project work sessions: Guided development and refinement of final project - One-on-one consultations with the instructor	- Final project submission - Project documentation and code review

17	CILO6	<b>Topic 4.4: Final Project Presentations</b> - Presentation of final projects - Peer and Instructor Feedback	- Final project presentations - Q&A sessions and peer feedback	- Final project presentation and defense - Feedback from peers and instructor
18		<b>FINAL EXAMINATION</b>		

## Part 5. References

### Books

- "Learning OpenCV 4: Computer Vision with Python" by Gary Bradski and Adrian Kaehler
- "Deep Learning with Python" by François Chollet
- "Computer Vision: Algorithms and Applications" by Richard Szeliski
- "Programming Computer Vision with Python" by Jan Erik Solem
- "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

### Online References

- Open CV Documentation  
<https://docs.opencv.org/>
- TensorFlow Documentation  
[https://www.tensorflow.org/api\\_docs](https://www.tensorflow.org/api_docs)
- Kaggle Datasets and Competitions  
<https://www.kaggle.com/>
- PyTorch Documentation  
<https://pytorch.org/docs/stable/index.html>

**Materials:** LED TV, Desktop Computer or Laptop, Handouts

## Part 6. Learners' Assessment (Grading System)

<b>Quizzes /Machine Problem</b>	<b>20%</b>
<b>Requirements</b>	<b>40%</b>
• Recitation/Participation	
• Project	
• Attendance	
• Assignment	
• Seatwork	
<b>Major Examination</b>	<b>40%</b>
<b>Total</b>	<b>100%</b>

## Part 7. Course Policies

1. Regular attendance is required for all students; three (3) unexcused absences will mean automatically dropped from the course.
2. Wearing of the University students' ID and uniform at all times is required for all the students except when having field activities.
3. Active participation individually or in group is expected.
4. Fifteen (15) minutes of tardiness is equivalent to one (1) period of absence.
5. Student shall abide the instructor/professor's policy on the submission of learning outputs based on the metrics and deadlines given.

Prepared by:	Reviewed:	Approved:
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