ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ
ವಿಟಿಯು ಅಧಿನಿಯಮ ೧೯೯೪ರ ಅಡಿಯಲ್ಲಿ ಕರ್ನಾಟಕ ಸರ್ಕಾರದಿಂದ ಸ್ಥಾಪಿತವಾದ ರಾಜ್ಯವಿಶ್ವವಿದ್ಯಾಲಯ
VISVESVARAYA TECHNOLOGICAL UNIVERSITY
State University of Government of Karnataka Established as per the VTU Act, 1994"JnanaSangama" Belagavi-590018, Karnataka, India

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REF: VTU/BGM/PEC-CSE (Cs IoT CBT)/707/2024-25/5924 DATE: 17 FEB 2025

CIRCULAR

Subject: Correction in the Professional Elective Course (PEC) for the Sixth Semester of CSE (IoT & Cyber Security including Blockchain) Programme.

Reference: email from Chairperson BoS in CSE/ISE, VTU Belagavi dated: 15.02.2025
The Hon'ble Vice-Chancellor's approval Dated: 17.02.2025

It has been observed that the Professional Elective Course (PEC) in the **sixth semester** of the **CSE (IoT & Cyber Security including Blockchain Technology)** program is **repeated** in the **seventh semester** as an IPCC course. This oversight occurred as the scheme and syllabus for the **seventh semester** were prepared during the **fifth semester**, before finalizing the scheme for the **sixth semester**.

To rectify this error, the following correction is hereby suggested by the BoS:

The existing **Professional Elective Course (PEC) - BCS613A Blockchain Technology** in the **sixth semester** shall be **replaced** with **BCS613B Computer Vision**.

All concerned are requested to take note of this correction and update records accordingly.

Encl: **Syllabus**

17/02/25
REGISTRAR

To,

- The Principals of affiliated/constituent Engineering Colleges under the ambit of the university
- The Chairperson /Program Coordinator of the university department at Kalaburagi, Mysuru, Bengaluru and Belagavi

Copy to:

- The Registrar (Evaluation) VTU Belagavi for information and needful
- The Special Officer, QPDS VTU Belagavi for information and needful
- The Director, ITI SMU VTU Belagavi for information and to make arrangements to upload the syllabus on the VTU web portal
- Office Copy

	COMPUTER VISION		Semester	6
	Course Code	**BCS613B**	CIE Marks	50
	Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
	Total Hours of Pedagogy	40	Total Marks	100
	Credits	03	Exam Hours	3
	Examination type (SEE)	**Theory**		

Course objectives:

CLO1: To understand the fundamentals of computer vision and digital image processing

CLO2: To introduce the processes involved image enhancement and restoration.

CLO3: To facilitate the students to gain understanding color image processing and morphology.

CLO5: To impart the knowledge of image segmentation and object recognition techniques.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Use animations/videos to help the students to understand the concepts.
7. Demonstrate the concepts using a suitable programming language.

Module-1

Introduction: What is computer vision? A brief history. **Image Formation:** Photometric image formation, The digital camera. **Image processing**: Point operators, Linear filtering.

Textbook-1: Chap-1 (1.1, 1.2), Chap-2 (2.2, 2.3), Chap-3 (3.1, 3.2)

Module-2

Image processing: More neighborhood operators, Fourier transforms, Pyramids and wavelets, and Geometric transformations.

Textbook-1: Chap- 3 (3.3 - 3.6)

Module-3

Image Restoration and Reconstruction: A model of Image degradation/restoration process, restoration in the presence of noise only, periodic noise reduction by frequency domain filtering.

Image Segmentation: Fundamentals, Point, Line and edge detection, thresholding (Foundation & Basic global thresholding only), Segmentation by region growing & region splitting & merging.

Textbook-2: Chap-5 (5.1 to 5.4), Chap-10 (10.1 to 10.3.2, 10.4)

Module-4

Color Image Processing: Color fundamentals, color models, Pseudocolor image processing, full color image processing, color transformations, color image smoothing and sharpening, Using color in image segmentation, Noise in color images.

	Textbook-2: Chap-6 (6.1-6.8)
	Module-5
	Morphological Image Processing: Preliminaries, Erosion and Dilation, opening and closing, Hit-or-miss transform, some basic morphological algorithms. **Feature Extraction:** Background, Boundary preprocessing (Boundary following & Chain codes only). **Image pattern Classification:** Background, Patterns and classes, Pattern classification by prototype matching (Minimum distance classifier only). **Textbook-2:** Chap -9 (9.1-9.5), Chap-11(11.1-11.2.2), Chap-12 (12.1-12.3.1)

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Explain the fundamentals of computer vision and its applications.
2. Apply the image enhancement techniques for smoothing and sharpening of images.
3. Compare the different image restoration and segmentation techniques.
4. Demonstrate the smoothing and sharpening techniques for color images.
5. Explain morphological, feature extraction, and pattern classification techniques for object recognition.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assessment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Implementation of Image processing and video processing techniques in Java/Python/Matlab is recommended.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Textbooks

1. Richard Szeliski, Computer Vision: Algorithms and Applications (Texts in Computer Science), 2nd Edition, 2022, Springer.
2. Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Pearson, 4th edition, 2019.

Reference books

1. David Forsyth and Jean Ponce, Computer Vision: A Modern Approach, 2nd Edition, Pearson, 2015.
2. Reinhard Klette, Concise Computer Vision - An Introduction into Theory and Algorithms, Springer, 2014.

Web links and Video Lectures (e-Resources):

- Virtual Labs: https://cse19-iiith.vlabs.ac.in/
- https://onlinecourses.nptel.ac.in/noc21_ee78/preview
- Introduction to Machine Vision: https://www.youtube.com/watch?v=tY2gczObpfU
- https://coral.ise.lehigh.edu/optml/files/2019/10/OptML_CV_tutorial_1_compressed.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Programming Assignment-1: Implementation of important concepts of Image enhancement (point & filters) and restoration techniques with C++/Java/Python - 10 Marks
- Programming Assignment-2: Implementation of segmentation, Morphological and color image processing techniques with C++/Java/Python - 15 Marks