Department of Computer Applications
National Institute of Technology Tiruchirappalli

1.Course Outline					
Course Title	Image & Video Analytics				
Course Code	CA620				
Department	CA	**Class**	I M.Tech	**No. of Credits**	3
Pre-requisites Course Code	NIL			**Faculty Name**	Dr.S.Domnic
CC Chairman	Dr.R.Eswari				
Name of Course Co-ordinator	Dr.P.J.A.Alphonse				
E-mail	domnic@nitt.edu			**Telephone No.**	+91-431-2503745
Course Type	Elective				

2. Syllabus approved in BoS

Digital image representation- Visual Perception- Sampling and Quantization- Basic Relations between Pixels- Mathematical Tools Used in Digital Image Processing: Fundamental Operations – Vector and Matric Operations- Image Transforms (DFT, DCT, DWT, Hadamard).

Fundamentals of spatial filtering: spatial correlation and convolution-smoothingblurring- sharpening-edge detection - Basics of filtering in the frequency domain: smoothing-blurring- sharpening--Histograms and basic statistical models of image.

Colour models and Transformations – Image and Video segmentation-Image and video demonising-Image and Video enhancement- Image and Video compression. Object detection and recognition in image and video-Texture models Image and Video classification models- Object tracking in Video.

Applications and Case studies- Industrial- Retail- Transportation & Travel- Remote sensing-Video Analytics in WSN: IoT Video Analytics Architectures

3. Course Objectives

- To teach the fundamentals of digital image processing, image and video analysis.
- To understand the real time use of image and video analytics.
- To demonstrate real time image and video analytics applications and others.

4. Course Outcomes (CO)

Student will be able to:

- Describe the fundamental principles of image and video analysis and have an idea of their application.
- Apply image and video analysis in real world problems.

5. Course Outcome (CO)	Aligned Programme Outcome (PO)											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
Describe the fundamental principles of image and video analysis and have an idea of their application.	H			H	M		M	H				
Apply image and video analysis in real world problems.	M			H	H							H

L-Low M-Medium H-High

6. Course Teaching and Learning Activities			
Week	**No. of Classes**	**Topic Covered**	**Mode of Delivery**
1	Class-I	Introduction to image processing	PPT, Chalk & Talk
	Class-II	Image formation, Quantization, Sampling	
	Class-III	Neighbourhood operations in Image	
2	Class-I	Region, Boundary, Foreground and Background	
	Class-II	Image Transforms	
	Class-III	Mathematical Tools for IP	
3	Class-I	DCT, WHT, DWT	
	Class-II	Intensity Transformations	
	Class-III	Histogram processing	
4	Class-I	Histogram Equalization	
	Class-II	Histogram Matching	
	Class-III	Local Histogram processing	
5	Class-I	Spatial filtering	
	Class-II	spatial correlation and convolution-smoothingblurring- sharpening	
	Class-III	edge detection	
6	Class-I	Basics of filtering in the frequency domain	
	Class-II	smoothing-blurring- sharpening	
	Class-III	Colour models and Transformations	
7	Class-I	Image and Video segmentation	
	Class-II	Image and video demonising	
	Class-III	Image and Video enhancement	
8	Class-I	Image and Video compression	
	Class-II	Object detection and recognition in image and video	
	Class-III	Texture models	
9	Class-I	Image and Video 25 classification models	
	Class-II	Object tracking in Video.	
	Class-III	Constrained optimization with lagrangian multipliers	
10	Class-I	Applications and Case studies-I	
	Class-II	Applications and Case studies-II	
	Class-III	Applications and Case studies-III	

7. Course Assessment Methods – Theorey				
Sl. No.	Mode of Assessment	Week/Date	Duration	Weightage(%)
1.	Cycle Test –1	6^{th} /7^{th}week	60 mins	15
2.	Cycle Test –2	12^{th}/13^{th} week	60 mins	15
3.	Assignment works/Hands on	1^{st} week to 13^{th}week	7 days	30
4	Compensation Assessment*		60 mins	15
5.	End Semester Exam	-	120 mins	40
			Total	100

8. Essential Readings (Textbooks, Reference books, Websites, Journals, etc.)

REFERENCES:

1. R.C. Gonzalez and R.E. Woods." Digital Image Processing". 3rd Edition. Addison Wesley, 2007.
2. W. Härdle, M. Müller, S. Sperlich, A. Werwatz, "Nonparametric and Semi parametric Models", Springer, 2004.
3. Rick Szelisk, "Computer Vision: Algorithms and Applications", Springer 2011.
4. Jean-Yves Dufour, "Intelligent Video Surveillance Systems", Wiley, 2013.
5. Caifeng Shan, Fatih Porikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012.
6. AsierPerallos, Unai Hernandez-Jayo, Enrique Onieva, Ignacio Julio García Zuazola, "Intelligent Transport Systems: Technologies and Applications", Wiley, 2015.
7. Basudeb Bhatta, "Analysis of Urban Growth and Sprawl from Remote Sensing Data", Springer, 2010

9. Course Exit Survey (mention the ways by which the feedback about the course is assessed and indicate the attainment level)

1. The students through the class rep may give their feedback at any time to the course co-ordinator which will be duly addressed.
2. The students may also give their feedback during Class Committee meeting.
3. 'Course Outcome Survey' form will be distributed on the last working day to all the students and the feedback on various rubrics will be analyzed.
4. The COs will be computed after arriving at the final marks.

10. Course Policy (including plagiarism, academic honesty, attendance, etc.)

- **ACADEMIC DISHONESTY & PLAGIARISM**
  Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty. Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

  The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

  The above policy against academic dishonesty shall be applicable for all the programmes.

- **Attendance**
  At least 75% attendance in each course is mandatory.

  A maximum of 10% shall be allowed under On Duty (OD) category.

  Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade

- **Compensation Assessment policy**
  One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered

11. Additional Course Information

- The students can get their doubts clarified at any time with their faculty member with prior appointment.

For Senate's Consideration

Dr.S. Domnic
Course Faculty

Dr.R.Eswari
Class Committee Chairperson

Dr. P.J.A.Alphonse
HOD