CS6475

Computational Photography @ Georgia Tech

CS6475 - Summer 2016 - Syllabus

1	General Information			
2	Course Number:	CS 6475-O01 (Summer 2016)		
3	Course Name:	Computational Photography		
4	Program:	Georgia Tech's Online MS in Computer Science		Link to GT OMS-CS Website
5				
6	Team/People			
7	Instructor	Irfan Essa		Irfan Essa's Home Page
8		Contact via Piazza. Email for Private and Urgent Issues ONLY		Piazza Site
9				
10	Head TA Emeritus	Daniel Castro		
11	Head TA	Kim Sirichoke		
12	TAs	Vickie Backman,		
13		Chris Gearhart		Contact via Piazza. Email for Private and Urgent Issues ONLY
14		Benjamin Engwall		
15		Matt Magnusson		
16		Phuc-Hai Huynh		
17				

18	Instructional Designers	Arpan Chakraborty & David Joyner		
19	Video Production	Aaron Gross		
20				
21	Assignments & Grading			
22	A.	Assignments / Homeworks Type 1: (There will be 2 assignments of this type)	4.0%	2% Each
23	B.	Assignments / Homeworks Type 2: (There will be 9 assignments of this type)	58.5%	6.5% Each
24	C.	Exam: [Scheduled two weeks before end of term, cumulative, and online]	15.0%	
25	D.	Student Choice Final Project	10.0%	Proposal 2%, Presentation / Report 8%
26	E.	Peer Reviewing/Feedback/Participation	6.0%	Entire Term
27	F.	Participation on Piazza	4.0%	Entire Term
28	G.	Final Portfolio	2.5%	At the End of Term
29				
30		Total	100.0%	
31				
32				
33	Policies			
34				
35	Communications			
36	A.	WITH the Professor and TA should be exclusively through Piazza. No emails! Professor and TAs will do their best to respond to questions within 2 days of posted question.		
37	B.	Piazza will serve as the primary and only source of communications and sharing announcements with the students.		Piazza Site

38	C.	All communications should be professional and courteous. TA/Graders and Students are all required to maintian high standards of interaction on Piazza		Piazza Site
39				
40	Assignments			
41	A.	T-square will be used for grading. Dates and Deadlines in T-square and the syllabus are the final authority		T-square
42	B.	Homeworks Assignments will be graded on a list of criteria such as quality of work, completeness, insight into technical issues, insight into other relevant issues, etc.		
43	C.	Each assignment will be graded and returned USUALLY within two weeks of submission. If there is delay for some reason, it will be announced.		
44	D.	Late Assignments: Everything is DUE when specified. NO extensions. Each day of LATE submission will result in 1 letter grade drop of the assignment grade		
45	E.	See collaboration policy below for more details on how to collaborate		
46	F.	Instruction provided with the assignment, MUST be explicitly followed, especially any and all directions like how to submit and the file naming conventions specified		
47	G.	Regrade requests can be made using the Google Form (on the right). Please provide clear details as to why you are requesting a regrade. All regrade requests must be made within TWO (2) weeks of the grade release. For grades released in the last two weeks of the term, the regrade request must be made by the last day of the final exams week.		Regrade Request Form
48				

49	Websites	Following are the websites we will OFFICIALLY use for this class.		
50	A.	T-square: For Assignment Submission, Grading, and Final Exam.		T-square
51	B.	Piazza: For Official Announcements, Forums for discussion.		Piazza Site
52	C.	WordPress Site: (This site) for syllabus/schedule and general information.		Worpdress
53	D.	Udacity for videos of lectures.		udacity.com
54	E.	Peer Feedback Site		peerfeedback.gatech
55	E.	No information will be shared via any other site (G+, FB, etc.). Students are welcome to create their own social media sites, but none of the instructors are required to be on those sites and will not participate there regularly.		
56	G.	As we have a 11 assignments, there will be overlap on assignments. We expect students to manage their schedule to meet the deadlines for each of the assignments		
57	H.	Students are welcome to work and submit assignments before their due date. TAs will try to answer questions related to the assignments as much as they can, but most conversations may be most active as per the Schedule planned for the class		
58				
59	Grading	Grading Scale (for each assignment/unit and for the entire class).		T-square
60	A	Above 90%		
61	B	80%-89.99%		
62	C	70%-79.99%		
63	D	60%-69.99%		
64	F	Below 60%		

65		Note: Any work that meets all the requirements will be given a 90%. For scores above 90%, work has to above and beyond meeting the basic requirements of the assigned work.		
66				
67	Honor Code	All assigned work is expected to be individual, except where explicitly written otherwise. You are encouraged to discuss the assignments with your classmates; however, what you hand in should be your own work. If any work product was produced based on discussions with someone else (in the class OR outside), please specify clearly in the final turn-in.		GT Honor Code
68				
69	Collaboration Policy	As stated above with the Honor Code, but worth making explicit here. Collaboration between students on work assigned in class is fine. You are encouraged to discuss your work with each other. But each individual students MUST submit their own work, done solely by themselves. In some cases, you may have had a fellow student or a non-student friend, help you with an assignment or work (say to take a picture!). You are REQUIRED to acknowledge any help you may have received in completing the work assigned, even as small as holding the light, or suggesting a possible path to a solution. Please be explicit and provide details.		

1	Week #	Week Begining	Description	Lecture	DUE (at 5pm EDT (Atlanta time) on Monday of each week)	Peer Feedback DUE (See Peer Feedback for exact time, will be a week after late submission deadline).	Readings (see Materials Sheet)

2	NOTE:	The following is SUBJECT to slight modifications over the course of the TERM. Assignment DUE is just included for references. For EXACT dates see T-square					
3	1	5/16/2016	Introduction	01-01, 01-02, 01-03, 01-04			Read: Szeliski Book Chapter 1 (skim), Chapter 2 (Section 2.2 and 2.3)
4	2	5/23/2016	Digital Imaging I & II	02-01, 02-02, 02-03, 02-04, 02-05, 02-06	Assignment #1: One Photograph. Assignment #2: Image input/output, Setup		Read: Szeliski Book Chapter 3 (Sections 3.1 – 3.6).
5	3	5/30/2016	Cameras	03-01, 03-02, 03-03, 03-04	Assignment #3: Epsilon Photography, Assignment #4: Gradient/Edges	Assignment #1: One Photograph. Assignment #2: Image input/output, Setup	Read: Torralba and Freeman (2012)
6	4	6/6/2016	Merging & Blending Images, Feature Detection / Matching	04-01, 04-02, 04-03, 04-04, 04-05, 04-06	Assignment #5: Camera Obscura	Assignment #3: Epsilon Photography, Assignment #4: Gradient / Edges	Read: Burt and Adelson (1983a), Burt and Adelson (1983b), Efros and Freeman (2001), Kwatra, Schödl, Essa, Turk, Bobick (2003)
7	5	6/13/2016	Image Transformation / Morphing / Panorama / HDR / Stereo	05-01, 05-02, 05-03, 05-04, 05-05	Assignment #6: Pyramid Blending, Assingment #7: Feature Detection	Assignment #5: Camera Obscura	
8	6	6/20/2016	Photo Synth, Camera Calibration	05-06, 05-07, 05-08, 05-09	Assignment #8: Panorama Assignment #10: Photos of Space	Assignment #6: Pyramid Blending, Assingment #7:	

					*(extended to be due 6/22)	Feature Detection	
9	7	6/27/2016	Video, Video Stabilization, Video Panoramas	06-01, 06-02, 06-03, 06-04	Assignment #9: HDR (extended to be due 6/29), TERM PROJECT PROPOSAL (due 6/27)	Assignment #8: Panorama Assignment #10: Photos of Space (PF will therefore be due 7/1)	
10	8	7/4/2016	Computational Cameras	07-01, 07-02, 07-03	Assignment #11: Video Textures,	Assignment #9: HDR (PF will therefore be due 7/8)	
11	9	7/11/2016	Additional READINGS	08-01, 08-02, 08-03		Assignment #11: Video Textures,	See Piazza Posts
12	10	7/18/2016	Additional READINGS	08-04, 08-05, 08-06			See Piazza Posts
13	11	7/25/2016	EXAM (Exam will be availale later in the week, and will be availble for 1 week, and will be ONLINE)	All Material to Date	TERM PROJECT REPORT	TERM PROJECT REPORT	EXAM will be Cummaltive (Will be availble for 1 week until WEDNESDAY OF THE EXAM PERIOD, and will be ONLINE)
14	12	7/28/2016	FINALS WEEK Begins			TERM PROJECT REPORT	See Piazza Posts
15	13	8/4/2016	FINALS WEEK Ends				See Piazza Posts

1	ID	Readings	LINK 1 (DOI)	LINK 2 (PDF or PROJECT SITE)
2	NOTE:	The following is SUBJECT to slight modifications over the course of the TERM		
3		Books		

4	Szeliski (2010)	Szeliski (2010), Computer Vision: Algorithms and Applications, Springer	http://dx.doi.org/10.1007/978-1-84882-935-0	http://szeliski.org/Book/
5	Forsyth & Ponce (2012)	Forsyth & Ponce (2012), Computer Vision: A Modern Approach, Pearson.	NOT REQUIRED, Just for Reference	http://www.pearsonhighered.com/educator/product/Computer-Vision-A-Modern-Approach-2E/9780136085928.page
6	Hecht, E. (2002)	Optics, 4th edition, Addison-Wesley	Just for Reference	
7	London, B., Stone, J., & Upton, J. (2011)	Photography, 10th edition, Prentice Hall	Just for Reference	
8	White, R. (2006)	White, R. (2006), How DIgital Photography Works, Que	Just for Reference	

		Publishers		
9		Papers		
10	Adelson and Bergen (1991)	Adelson and Bergen (1991), “The Plenoptic Function and the Elements of Early Vision” Computational models of visual processing		http://persci.mit.edu/pub_pdfs/elements91.pdf
11	Adelson and Wang (1992)	Adelson and Wang (1992) “Single lens stereo with a plenoptic camera”, IEEE PAMI 14(2)		http://persci.mit.edu/pub_pdfs/plenoptic.pdf
12	Agarwala (2004)	Agarwala, Dontcheva, Agrawala, Drucker,		http://grail.cs.washington.edu/projects/photomontage/photomontage.pdf

		Colburn, Curless, Salesin and Cohen (2004), "Interactive digital photomontage" ACM SIGGRAPH		
13	Agarwala (2005)	Agarwala, Zheng, Pal, Agrawala, Cohen, Curless, Salesin, and Szeliski (2005), "Panoramic Video Textures", ACM SIGGRAPH 2005		http://grail.cs.washington.edu/projects/panovidtex/panovidtex.pdf
14	Avidan and Shamir (2007)	Avidan and Shamir (2007), “Seam carving for content-aware image resizing”		http://perso.crans.org/frenoy/matlab2012/seamcarving.pdf

		, SIGGRAPH 2007.		
15	Bai (2012)	Bai, Agarwala, Agrawala, Ramamoorthi (2012), "Selectively De-Animating Video", ACM SIGGRAPH 2012	http://dx.doi.org.www.library.gatech.edu:2048/10.1145/2185520.2185562	http://graphics.berkeley.edu/papers/Bai-SDV-2012-08/
16	Baker (2010)	Baker, Bennett, Kang, & Szeliski (2010) “Removing Rolling Shutter Wobble” in IEEE CVPR 2010		http://research.microsoft.com/pubs/121490/0198.pdf
17	Banterle (2011)	Banterle, Artusi, Debattista, and Chalmers (2011) Advanced High Dynamic Range Imaging		

		CRC Press. (with Matlab Code)		
18	Beier and Neely (1992)	Beier and Neely (1992). “Feature-based Image Metamorphosis” ACM SIGGRAPH 1992		https://www.cs.princeton.edu/courses/archive/fall00/cs426/papers/beier92.pdf
19	Boykov and Jolly (2001)	Boykov and Jolly (2001), “Interactive Graph Cuts for Optimal Boundary & Region Segmentation of Objects in N-D images, ICCV 2001.		http://www.eecs.berkeley.edu/~efros/courses/AP06/Papers/boykov-iccv-01.pdf
20	Brown and Lowe (2003)	Brown and Lowe (2003). “Recognising Panoram	http://www.cs.bath.ac.uk/brown/papers/bib/iccv2003.txt	http://www.cs.bath.ac.uk/brown/papers/iccv2003.pdf

		as." International Conference on Computer Vision (ICCV2003)		
21	Burt and Adelson (1983a)	Burt and Adelson (1983a) "The Laplacian Pyramid as a Compact Image Code", In IEEE Transactions on Communications, 31 (4). p 532-540. 1983	http://dx.doi.org/10.1109/TCOM.1983.1095851	
22	Burt and Adelson (1983b)	Burt and Adelson (1983b) "A multiresolution spline with application to image mosaics". In ACM Transactions on	http://dx.doi.org/10.1145/245.247	http://persci.mit.edu/pub_pdfs/spline83.pdf

		Graphics, 2 (4). 1983		
23	Davis (1998)	Davis (1998), “Mosaics of Scenes with Moving Objects”. Computer Vision and Pattern Recognition (CVPR),1998.		https://users.soe.ucsc.edu/~davis/panorama/cvpr98_moving_objects.pdf
24	Debevec (2012)	Debevec (2012), “The Light Stages and Their Applications to Photoreal Digital Actors”, SIGGRAPH Asia 2012 Technical Briefs		http://gl.ict.usc.edu/LightStages/SIGGRAPHAsia-2012-Debevec-LightStages.pdf
25	Debevec and Malik	Debevec and Malik (1997). “Recovering High		http://www.pauldebevec.com/Research/HDR/debevec-siggraph97.pdf

	(1997)	Dynamic Range Radiance Maps from Photographs.” In SIGGRAPH 1997		
26	Durand and Dorsey (2002)	Durand and Dorsey (2002), “Fast Bilateral Filtering for the Display of High-Dynamic-Range Images” In SIGGRAPH 2002.		http://people.csail.mit.edu/fredo/PUBLI/Siggraph2002/DurandBilateral.pdf
27	Efros and Freeman (2001)	Efros and Freeman (2001), “Image Quilting for Texture Synthesis and Transfer” SIGGRAPH 2001	http://dx.doi.org/10.1145/383259.383296	http://graphics.cs.cmu.edu/people/efros/research/quilting/quilting.pdf
28	Forssén, &	Forssén, & Ringaby		https://www.cvl.isy.liu.se/research/datasets/rs-dataset/0382.pdf

	Ringaby (2010)	(2010) “Rectifying rolling shutter video from hand-held devices” in IEEE CVPR 2010		
29	Gorler (1996)	Gorler, Grzeszczuk, Szeliski, Cohen (1996) “The Lumigraph”ACM SIGGRAPH 1996		http://research.microsoft.com/pubs/68168/Gortler-SG96.pdf
30	Grossberg and Nayar (2003)	Grossberg and Nayar (2003), “Determining the Camera Response from Images: What is Knowable?,” IEEE Transactions on Pattern Analysis and Machine		http://cilab.knu.ac.kr/seminar/Seminar/2009/20091128%20Determining%20the%20Camara%20Response%20from%20Images-%20What%20Is%20Knowable.pdf

		Intelligence, 2003		
31	Grundmann, Kwatra, and Essa (2011)	Grundmann, Kwatra, and Essa (2011), “Auto-Directed Video Stabilization with Robust L1 Optimal Camera Paths,” in Proceedings of IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2011	http://dx.doi.org/10.1109/CVPR.2011.5995525	http://www.cc.gatech.edu/cpl/projects/videostabilization/
32	Grundmann, Kwatra, Castro, and Essa	Grundmann, Kwatra, Castro, and Essa (2012), “Calibration-Free Rolling Shutter Removal		http://www.cc.gatech.edu/cpl/projects/rollingshutter/

	(2012)	," in Proceedings of IEEE Conference on Computational Photography (ICCP), 2012.		
33	Harris and Stephens (1988)	Harris and Stephens (1988) "A Combined Corner and Edge Detector." Proceedings of the 4th Alvey Vision Conference, 1988	http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.231.1604	http://www.bmva.org/bmvc/1988/avc-88-023.pdf
34	Jones (2104)	Jones, Sodhi, Murdock, Mehra, Benko, Wilson, Ofek,, MacIntyre, Shapira, (2104) "RoomAlive:		http://projection-mapping.org/wp-content/uploads/2014/01/RoomAlive_UIST2014.pdf

		Magical Experiences Enabled by Scalable, Adaptive Projector-Camera Units" ACM UIST, 2014		
35	Joshi (2012)	Joshi, Mehta,Drucker, Stollnitz, Hoppe, Uyttendaele, Cohen (2012)," Cliplets: Juxtaposing Still and Dynamic Imagery" , In ACM UIST 2012		http://research.microsoft.com/en-us/um/redmond/projects/clipletsdesktop/paper/paper_uist_final.pdf
36	Kushal (2012)	Kushal, Self, Furukawa, Gallup, Hernandez, Curless, Seitz (2012) "Photo	http://doi.ieeecomputersociety.org/10.1109/3DIMPVT.2012.62	

		tours”, 3DPTV 2012		
37	Kwatra (2003)	Kwatra, Schödl, Essa, Turk, Bobick (2003), “Graphcut textures: image and video synthesis using graph cuts” SIGGRAPH 2003	http://doi.acm.org/10.1145/882262.882264	http://www-static.cc.gatech.edu/gvu/perception/projects/graphcuttextures/gc-final.pdf
38	Lee (2004)	Lee, Dietz, Aminzade, and Hudson, (2004) “Automatic Projector Calibration using Embedded Light Sensors”, ACM UIST 2004		http://www.merl.com/publications/docs/TR2004-036.pdf
39	Levin (2007)	Levin, Fergus, Durand,		http://groups.csail.mit.edu/graphics/CodedAperture/CodedAperture-LevinEtAl-SIGGRAPH07.pdf

		Freeman (2007), “Image and Depth from a Conventional Camera with a Coded Aperture ”ACM SIGGRAPH 2007		
40	Levoy and Hanrahan (1996)	Levoy and Hanrahan (1996) “Light field Rendering”, ACM SIGGRAPH 1996		https://graphics.stanford.edu/papers/light/light-lores-corrected.pdf
41	Lowe (2004)	Lowe (2004) “Distinctive Image Features from Scale-Invariant Keypoints”. IJCV 2004		http://www.cse.unr.edu/~bebis/CS491Y/Papers/Lowe04.pdf
42	Marner (2104)	Marner, Smith, Walsh, Thomas (2104), “Spatial		http://www.computer.org/cms/Computer.org/ComputingNow/issues/2015/01/mcg2014060074.pdf

		User Interfaces for Large Scale Projector-Based Augmented Reality”, in IEEE CGA 2014		
43	McMillan & Gortler (1999)	McMillan & Gortler (1999) “Image-Based Rendering:A New Interface Between Computer Vision and Computer Graphics ”Applications of Computer Vision to Computer Graphics Vol 33, No 2 1999	http://www.siggraph.org/publications/newsletter/v33n4/contributions/mcmillan.html	
44	Mikolajczyk	Mikolajczyk and Schmid	http://dx.doi.org/10.1109/ICCV.2001.937561	

	and Schmid (2001)	(2001). “Indexing Based on Scale Invariant Interest Points”. ICCV 2001		
45	Ng (2005)	Ng, Levoy, et al. (2005), “Light field photography with a hand-held plenoptic camera” Stanford Tech Report CTSR 2005-02, 2005		http://graphics.stanford.edu/papers/lfcamera/lfcamera-150dpi.pdf
46	Raskar (2006)	Raskar, Agrawal, Tumblin (2006) “Coded Exposure Photography: Motion Debarring using Fluttered Shutter” ACM		https://drive.google.com/folderview?id=0B6yqgGWSjCbpaExmZUY3eERJX0k&usp=sharing&tid=0B6yqgGWSjCbpMlQ4cmwzalhPSmc#zSoyz

		SIGGRAPH 2006		
47	Raskar (2009)	Raskar (2009) “Computational Photography: Epsilon to Coded Photography”, Emerging Trends in Visual Computing, Springer 2009		http://web.media.mit.edu/~raskar/Talks/ETCVparis08/raskarCompPhotoEpsilonCodedETVC08paper.pdf
48	Reinhard (2002)	Reinhard, Stark, Shirley and Ferwerda (2002), “Photographic Tone Reproduction for Digital Images”, In SIGGRAPH 2002.		http://www.cmap.polytechnique.fr/~peyre/cours/x2005signal/hdr_photographic.pdf
49	Schödl (2000)	Schödl, Szeliski, Salesin, Essa (2000) "Video Textures	http://dx.doi.org/10.1145/344779.345012	http://www.think-cell.com/pdf/think-cell_article_siggraph2000.pdf

		" SIGGRAPH 2000		
50	Schödl and Essa (2002)	Schödl and Essa (2002), "Controlled animation of video sprites" in ACM SIGGRAPH Symposium on Computer animation		http://www.think-cell.com/pdf/think-cell_article_sca2002.pdf
51	Smith (1998)	Smith (1998), The Scientist and Engineer's Guide to Digital Signal Processing		http://www.dspguide.com/
52	Snavely (2010)	Snavely, Seitz, Szeliski (2010) "Photo tourism: Exploring photo collections in		http://phototour.cs.washington.edu/Photo_Tourism.pdf

		3D," ACM SIGGRAPH 2006		
53	Snavely, Seitz, Szeliski (2006)	Snavely, Seitz, Szeliski (2006), "Photo tourism: Exploring photo collections in 3D," ACM Transactions on Graphics (SIGGRAPH Proceedings), 25(3), 2006, 835-846.	http://dx.doi.org/10.1145/1179352.1141964	http://phototour.cs.washington.edu/Photo_Tourism.pdf
54	Snavely, Seitz, Szeliski (2007)	Snavely, Seitz, Szeliski (2007), "Modeling the world from Internet photo collections," International Journal of		http://phototour.cs.washington.edu/ModelingTheWorld_ijcv07.pdf

		Computer Vision		
55	Summet (2007)	Summet, Flagg, Cham, Rehg and Sukthankar (2007) "Shadow Elimination and Blinding Light Suppression for Interactive Projected Displays" IEEE TVCG 2007		http://www.cc.gatech.edu/~summetj/papers/summet-tvcg-0014-0206.pdf
56	Tamburo (2014)	Tamburo, Nurvitadhi, Chugh, Chen, Rowe, Kanade and Narasimhan (2014) "Programmable Automotive Headligh		http://www.cs.cmu.edu/~ILIM/publications/PDFs/TNCCRKN-ECCV14.pdf

		ts"ECCV 2014		
57	Torralba and Freeman (2012)	Torralba and Freeman (2012). Accidental pinhole and pinspeck cameras: revealing the scene outside the picture. Proceedings of 25th IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2012)		http://people.csail.mit.edu/torralba/research/accidentalcameras/
58	Ward (2001)	Ward (2001), "High Dynamic Range Imaging," Proceedings of the Ninth		http://www.pauldebevec.com/Research/HDR/Ward-HDRImaging-20010521.pdf

	Color Imaging Conference, November 2001.		

1	Module		Lecture	Title	Number of Units (Morsels)	Video Lecture Duration (HH:MM:SS)	
2	NOTE:		The following is SUBJECT to slight modification over the course of the TERM				
3	M01			Introduction to Computational Photography			
4			M01-01	Introduction	14	0:16:30	
5			M01-02	What is Computational Photography?	11	0:18:54	
6			M01-03	Teaser Example 1: Dual Photography	9	0:13:36	
7			M01-04	Teaser Example 2: Panorama	13	0:15:01	
8			M01-05	Why Study Computational Photography?	19	0:28:13	
9					TOTAL	1:32:14	
10	M02			Digital Imaging			
11			M02-01	Digital Image Representations	19	0:36:32	
12			M02-02	Point Processes	9	0:17:09	
13			M02-03	Blend Modes	10	0:12:18	
14			M02-04	Image Smoothing	14	0:27:54	
15			M02-05	Convolution and Cross Correlation	18	0:30:13	

16			M02-06	Computing Image Gradients	20	0:32:40	
17			M02-07	Image Edges	14	0:27:08	
18					TOTAL	3:01:56	
19	M03			Cameras, Optics, Sensors			
20			M03-01	Cameras	17	0:33:54	
21			M03-02	Lenses	16	0:28:16	
22			M03-03	Exposure Triangle	16	0:27:50	
23			M03-04	Sensor	15	0:28:04	
24					TOTAL	1:58:04	
25	M04			Image Analysis			
26			M04-01	Fourier Transform	19	0:28:43	
27			M04-02	Blending	10	0:19:30	
28			M04-03	Pyramids	15	0:20:34	
29			M04-04	Cuts	12	0:17:37	
30			M04-05	Features	18	0:30:28	
31			M04-06	Features (SIFT/Harris)	24	0:36:04	
32					TOTAL	2:32:56	

33	M05			Applications			
34			M05-01	Image Transformations		0:43:17	
35			M05-02	Image Morphing		0:26:51	
36			M05-03	Panorama		0:28:05	
37			M05-04	High Dynamic Range		0:37:51	
38			M05-05	Stereo		0:43:40	
39			M05-06	Photo Synth		0:33:37	
40			M05-07	Extrinsic Camera Calibration			
41			M05-08	Intrinsic Camera Calibration			
42			M05-09	Camera Calibration			
43					TOTAL	3:33:21	
44	M06			Video			
45			M06-01	Video Representation		0:17:00	
46			M06-02	Video Textures		0:24:00	
47			M06-03	Video Stabilization		0:37:30	
48			M06-04	Panoramic Video Textures		0:20:00	
49					TOTAL	1:38:30	

50	M07			Computational Cameras			
51			M07-01	Light Fields		0:35:00	
52			M07-02	Projector Camera Systems		0:31:00	
53			M07-03	Coded Photography		0:42:00	
54			M07-04	Closing		0:02:00	
55					TOTAL	1:50:00	
56							
57	TOTAL					16:07:01	

1	Assignment #	Title	Goal	%	DUE WEEK
2	DUE DATES of THESE are available via T-SQUARE and the SYLLABUS				
3	1	A Photograph is a photograph	Share one picture to get started with class	2	2
4	2	Image I/O & Python Setup	Setup your computing environment	2	2
5	3	Epsilon Photography	2 picture with Epsilon Difference	6.5	3
6	4	Gradients and Edges	Computing with Images	6.5	3
7	5	Camera Obscura	Build a PinHole Camera	6.5	4
8	6	Blending	Experiment with Image Blending	6.5	5
9	7	Feature Detection	Use Feature Detection	6.5	5
10	8	Panoramas	Build a Simple Panorama	6.5	6

11	9	HDR	Experiments with HDR	6.5	6
12	10	Photos of Space	Generate Panorama and PhotoSynths	6.5	7
13	11	Video Textures	Build a Video Texture	6.5	8
14					
15		Total		62.5	