Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA301	**Title of the Course**	COMPUTER GRAPHICS AND MULTIMEDIA APPLICATION	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	CA312				
Course Objectives	• To learn the principles of hardware and software behind the graphical environment. To learn about the design and implementation of graphical object by understanding basic algorithms for scan conversion of different graphical primitives and filling their inner areas. • To learn about transformation and modeling of original primitive and their clipped version into dimensional space by understanding the different algorithms. • To learn projecting any graphical primitive from higher dimensional space to 2-D space. • To learn the various aspects of rendering visible surfaces. • To learn the creation of animated objects and their images by knowing various aspects of media and learn the concept of audio, images and videos. Also, to learn minimization of memory requirements for graphical objects by rendering objects and surfaces and compressing Images.						

Course Outcomes	
CO1	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO2	Implement the various algorithms for scan conversion and filling of basic objects and their comparative analysis.
CO3	Apply geometric transformations on original and clipped graphics objects and their application in composite form in 2D and 3D.
CO4	Apply projection techniques for improving the object appearance from3D scene on 2D screen.
CO5	Implement interactive graphics applications and games that use animation techniques, audio, video by minimizing memory requirements through compression techniques.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction	Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Hardware and Software for Computer Graphics, Conceptual Framework for Interactive Graphics, Overview, Scan: Converting Lines, Converting Circles, Converting Ellipses.	8	CO1
2	Display Technologies	Raster-Scan Display System, Video Controller, Random-Scan Display Processor, Input Devices for Operator Interaction, Image Scanners, Working Exposure on Graphics Tools like Dream Weaver, 3D Effects. Clipping: Cohen-Sutherland Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision Algorithm.	8	CO2
3	Geometrical Transformation	2D Transformation, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations, Window-to-Viewport Transformations.	8	CO3
4	Representing Curves and Surfaces	Polygon Meshes Parametric, Cubic Curves, Quadric Surface. Solid Modeling**:** Representing Solids, Regularized Boolean Set, Operation Primitive Instancing, Sweep Representations, Boundary Representations, Spatial Partitioning Representations, Constructive Solid Geometry, Comparison of Representations**.**	8	CO4
5	Introductory Concepts	Multimedia Definition, CD-ROM and the Multimedia Highway, Computer Animation Design, Types of Animation, Different Graphical Functions. Multimedia**:** Uses of Multimedia, making a Multimedia, The Stage of Project, Hardwareand Software Requirements to make Good Multimedia, Skills and Training Opportunities in Multimedia, Motivation for Multimedia Usage, Introduction to Gaming.	8	CO5

Reference Books:

1. Foley, Van Dam, Feiner, Hughes, "Computer Graphics Principles and Practice", Addison Wesley**.**
2. D.J. Gibbs and D.C. Tsichritzs, "Multimedia Programming Object Environment and Framework", LNCS Tutorial**.**
3. D. Haran and Baker, "Computer Graphics", Prentice Hall of India.

e-Learning Source:

1. https://onlinecourses.swayam2.ac.in/aic22_ts42/preview
2. https://www.tutorialspoint.com/the_ultimate_canva_graphic_design_course/index.asp

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2		1		1						1	2				
CO2		2	3	1	1	1	2						1	1				
CO3		2	3		1	3	1	2					3	1				
CO4		1	2	3	1		2	1					1	3				
CO5		1	1	3		2	1	2					1	1				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA302	**Title of the Course**	UNIX AND SHELL PROGRAMMING	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	CA310				
Course Objectives	• To learn basic knowledge about architecture of Unix/Linux and different basic Commands of Unix/Linux. • To learn how to use process management. • To learn the importance of system administration tasks. • To learn the shell programming. • To learn basics of filter commands.						

Course Outcomes	
CO1	Able to understand architecture and basic commands of Unix/Linux.
CO2	Able to understand creation of process and scheduling of process.
CO3	Understand how to perform administration task.
CO4	To understand the basic structure of shell programming and understand the conditional statements and looping statements
CO5	Able to understand the concepts of basic filter commands.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to UNIX	Basic Features, Advantages, Basic Architecture of UNIX/LINUX System, Kernel, Shell, UNIX File System: Boot Block, Super Block, I-node Block, Data Blocks, Directories, Conversion of Pathname to I-node, I-node to a New file, Disk Block Allocation, Basic UNIX Commands, Directory Commands, File Related Commands, Disk Related Commands, General Utilities, Mathematical Commands.	8	CO1
2	Process Management	Processes in UNIX, Process Fundamentals, Creating a New Process, Parent Child Process, Connecting Processes with Pipes, Background Process, Managing Multiple Processes, Process Related Commands, Changing Process Priority. Process Scheduling: Scheduling of Processes, Process Daemon, Process Scheduling Commands. vi Editor: Creating and Editing Files with vi, Modes of vi Editor.	8	CO2
3	UNIX System Administration	Common Administrative Tasks, Identifying Administrative Files, Role of System Administrator, Superuser using su, Managing User Accounts: Adding and Deleting Users, Changing Permissions and Ownerships, Creating and Managing Groups, Modifying Group Attributes, Temporary Disable User Accounts, Creating and Mounting File System, Checking and Monitoring System Performance, File Security and Permissions.	8	CO3
4	Introduction to Shell Programming	Basic of Shell Programming, Various Types of Shell Available in UNIX, Comparisons Between Various Shells, Shell Script Features, Executing a Shell Script, read, echo and expr Command, Parameter Passing, Shell Variables, System Shell Variables, Shell Keywords, Conditional Statement, Test Command, File Test, String Test, Numeric Test, Case Statements, Looping Statements.	8	CO4
5	Simple Filter Commands	pr, head, tail, cut, paste, sort, uniq, tr, Filter using Regular Expressions: grep, egrep, Text Formatting Tools: nroff, tbl, eqn, pic, Introduction to sed and awk	8	CO5

Reference Books:

1. Sumitabha Das, "UNIX – Concepts and Applications", Tata McGraw Hill Publications.
2. Graham Glass, King Ables, "UNIX for Programmers and Users", Pearson Education.
3. Cristopher Negus, "Red Hat Linux 9 Bible", IDG Books India Ltd.

e-Learning Source:

1. https://www.tutorialspoint.com/unix_command_course_for_beginners/index.asp
2. https://www.tutorialspoint.com/unix/unix_tutorial.pdf

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	1		1			1					1					
CO2	3	1	2	1		2	1						2	1				
CO3	1	1	3		1		2						3	2				
CO4	2	1	1	1		2							1	1				
CO5	2	1	2		1		1						2	2				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA303	**Title of the Course**	DATA COMMUNICATION AND COMPUTER NETWORKS	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• Build an understanding of the fundamental concepts of Data communication. Familiarize the student with the basic taxonomy and terminology of signals. • To learn about the Modulation and Data Encoding methods. To study about the Multiplexing Techniques and different switching technique. • Get knowledge about the Network and its application. Study about the different Network Topologies. Introduce the student to OSI Model, preparing the student for entry Advanced courses in computer networking. • To understand the concepts of TCP/IP protocol suite. Build an understanding of the various data link layer protocol and its applications. • Understanding of the various the various internetworking devices. To study the IEEE 802 Project.						

Course Outcomes	
CO1	Understand the basic data communication network System. Identify the different types of signals. Able to understand Microwave Transmission System. Distinguish between the concepts and principles behind various data transmission Techniques.
CO2	Able to understand about the Data Modulation and Data Encoding methods. Able to understand about the Multiplexing Techniques. Able to understand about the Switching techniques.
CO3	Understand the basic idea of network. Able to understand virtual circuit network. Familiar with the layers of the OSI model. Identify the different types of network topologies and protocols.
CO4	Understand about the TCP/IP protocol suite. Able to understand various types of Flow control technique. Distinguish between the concepts behind various protocols
CO5	Able to identify and correct use of various types of communication channels. Able to demonstrate knowledge and understanding of relevant data communications standards.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Data Communication	Introduction, Communication Systems, Types of Data: Analog and Digital, Types of Signals: Analog and Digital, Communication Channel and its Characteristics, Transmission Modes, Synchronous and Asynchronous Transmission, Bit Rate and Baud, Radio Transmission Systems: Medium Wave, Short Wave, Microwave Transmission System, Terrestrial and Satellite (VSAT), Infrared Transmission.	8	CO1
2	Data Modulation and Data Encoding	Concept of Modulation, Analog Data Analog Signal, Analog Data Digital Signal, Digital Data Analog Signal, Digital Data Digital Signal. Introduction to Multiplexing: Space Division Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing. Switching techniques: Circuit and Packet switching.	8	CO2
3	Networking	An Overview, Network Goals, Application of Networks. Network Structure Services: Datagram, Virtual Circuit and Permanent Virtual Circuit, Connectionless and Connection Oriented Communication. Network Topologies**:** Bus, Ring, Star Topologies. OSI Model: Introduction to ISO-OSI Reference Model and its Layers, Network Architectures, Protocol Hierarchy and Layering Concepts. OSI Terminology: Interface, Protocol, Service Primitives.	8	CO3
4	ITCP/IP Suite	Introduction to TCP/IP Protocol, Brief Overview of TELNET, FTP, TFTP, SMTP, NFS, SNMP, DNS. Data Link Layer Design Issues: Services Provided to Network Layer Training: Necessity and Techniques, Error Control Features and Review of Techniques. Flow control: Sliding Window Protocols, Go Back N, Selective Repeat, Examples of Data Link Protocols (BSC, HDLC).	8	CO4
5	Local Area Network (LAN)	IEEE Standard 802 for LAN, IEEE Standard 802.3: CSMA/CD LAN and Ethernet LAN, IEEE Standard 802.4: Token BUS LAN, IEEE Standard 802.5: Token Ring LAN, FDDI, Repeaters, Bridges, Router, Gateways, Switching and Hubs, LAN H/W, LAN Operating System, Transmission Media, Baseband vs Broadband, Implementation using Co-Axial, Twisted Pair, Fibre Optic Cables, Wireless Technology, Introduction to MAN and WAN.	8	CO-5

Reference Books:

1. B. Forouzan, “Data Communication and Networking”, Tata McGraw Hill.
2. W. Stallings, “Data and Communication”, Prentice Hall of India.
3. Lin and Chlatmac, “Wireless and Mobile Network Architecture”, John Wiley and Sons.

e-Learning Source:

1. https://www.tutorialspoint.com/computer_network_basics/index.asp
2. https://nptel.ac.in/courses/106105183

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	1	1	1			1					1	1				
CO2	3	1	2	1		1	1						1	2				
CO3	2	2	1	1		2							1	1				
CO4	3	2	1	1		1							2	2				
CO5	1	3	2	1		2	1						3	2				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA304	**Title of the Course**	WEB DESIGNING CONCEPTS	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	CA311				
Course Objectives	• To learn basic knowledge of project planning and development. • To learn how to communicate throughout the project. • To learn the role of Quality Assurance and technological advances. • To learn fundamental language of internet i.e. HTML, DHTML and CSS. • To learn basics of client side Java Script and Server Side programming constructs.						

Course Outcomes	
CO1	Able to manage project team and successful development.
CO2	Ability to perform effective communication through system.
CO3	Upgrading skill set according to latest market needs and use web testing tools.
CO4	Hands on practice on HTML and learn the need and basics of CSS and the concepts of Client Side JavaScript.
CO5	Acquainted with the difference between Client Side and Server Side Scripting.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to the Project	Defining a Project, The Budget, More Preliminary Planning Issues. The Team: New Web Team, Putting Together the Right Team, Managing the Team, Team Dynamics. Planning and Process Development: Early Planning, Creative and Content Planning, Technical Planning, Production Planning, Reiteration, Effective Meetings Reviews and Interviews.	6	CO1
2	Communication Issues	Communication Breakdown, Creating Effective Communication System, Leading Effective Meetings and Communication throughout the Project, Giving the Project, Up-Front Challenges, Production Management, The Subsite.	7	CO2
3	Quality Assurance and Testing	Quality Assurance, The Role of Testing in Quality Assurance, Web Testing Tools. Technological Advances and the Impact on Web Teams: Emerging Technologies and Changing Needs, Preparing for Change. The Evolving Team: The Care and Grooming of the Team etc.	7	CO3
4	Introduction to HTML	Internet Basics, Introduction of HTML, Lists, Adding Graphics to HTML Documents, Tables, Linking Documents, Frames, Some Projects in HTML, DHTML, Introduction to DHTML, Cascading Style Sheets Class, External Style, ISSS, Layers etc.	11	CO4
5	JavaScript	Introduction to JavaScript, Client Side Scripting, JavaScript Document, Declaration and Expressions, Control Structures and Functions, Properties, Methods, Events in JavaScript, Design of Interactive Forms, Image Handling, Objects in JavaScript, Forms used by a Website, Cookies, Some Projects on JavaScript, Presenting Web Services and Security.	9	CO5

Reference Books:

1. Jessica Burdman, "Collaborative Web Development", Pearson Education Asia.
2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", BPB Publication.
3. Mark O'Ncile, "Web Services – Security", TMH.

e-Learning Source:

1. https://www.tutorialspoint.com/html_web_development/index.asp
2. http://www.freebookcentre.net/Web/Free-Web-Design-Books-Download.html

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	3	1	3								1	1				
CO2		3		2	1								1	2				
CO3						3		2					2	1				
CO4	2	3	2	2		2	1	2					1	1				
CO5	2	3		2				3					2	2				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA305	**Title of the Course**	OPTIMIZATION TECHNIQUE	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• To learn basic OR concepts, models, OR theory and its application in business model. • To build capabilities for analyzing various industrial situation and find the optimum solution for the problem given. To learn concepts and tools in order to understood various OR mathematical methods to solve business problem. • To formulate various model in ordered to solve decision making problem in business. • To learn quantitative methods and techniques for effective decision making process.						

Course Outcomes	
CO1	Understand OR concepts, its application in decision making and various decision making approaches.
CO2	Formulate and solve various mathematical problem using Linux programming techniques.
CO3	Develop and solve transportation model and assignment problem Model.
CO4	Analyze and solve decision making situation in inventory management.
CO5	Understand various queuing conditions and identify the best optimal solution using various models.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction and Development of Operations Research	Origin and Development of Operation Research, Nature, Meaning and Characteristics of Operation Research. Operations Research Models and Decision Making: Defining Model, Types of Operation Research Models, Classification of Operation Research Models, Application and Limitations of Operation Research, Steps in Decision Making, Situations of Decision Making.	8	CO1
2	Linear Programming	Linear Programming Formulation, Methods of Solving Linear Programming Problem: Graphical, Simplex Method, Big- M Method and Two-Phase Method, Duality in L.P.	8	CO2
3	Transportation Problems	Test for Optimality, Degeneracy in Transportation Problems, Unbalanced Transportation Problem, Traveling Salesman Problem. Assignment Problems: Assignment Algorithm or Hungarian Method.	8	CO3
4	Inventory	Inventory Decision, Cost Involved in Inventory Problem, Classification of Inventory Models. Elementary Deterministic Models: Model 1 (Uniform Demand, Instantaneous Replenishment without Shortage Cost), Model 2(Uniform Demand, Instantaneous Replenishment without Shortage Cost), Model3 (Uniform Demand, Finite Production Rate without Shortage Cost)	8	CO4
5	Job Sequencing	Introduction, Solution of Sequencing Problem, Johnson's Algorithm for n Jobs through 2 Machines. Queuing Theory: Characteristics of Queuing System, Classification of Queuing Model, Single Channel Queuing Theory, Generalization of Steady State M/M/1 Queuing Models (Model-I, Model-II).	8	CO5

Reference Books:

1. Gillet B.E., "Introduction to Operation Research", TMH.
2. Taha, H.A., "Operation Research - An Introduction", Prentice Hall.
3. Kanti Swarup, "Operation Research", Sultan Chand and Sons.
4. S. D. Sharma, "Operation Research", Kedar Nath, Ram Nath and Co. Meerut.
5. K. Rajgopal, "Operations Research", PHI.

e-Learning Source:

1. https://nptel.ac.in/courses/108103108
2. https://www.geeksforgeeks.org/optimization-for-data-science/

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2	1	1		1						1	2				
CO2		3	2	2	1	1	1						2	2				
CO3	1	2	3	1		2	2						3	3				
CO4		2	2	1	1	2	1	1					2	3				
CO5	2	2	1	1		1		2					2	3				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA306	**Title of the Course**	SIMULATION AND MODELING	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• To learn the basics of System, Simulation modeling and various types of simulation models. • To learn the concept of Corporate and Full Corporate Model, types of System study along with System analysis and design • To learn the comparison of Simulation with Analytical methods. • To learn the numerical computational techniques for continuous and discrete models. • To learn the concept of Continuous system Simulation Language and Real time simulation. • To learn the experimental models and generalization of Growth models. • To learn the drawing of Simple System Dynamic diagrams.						

Course Outcomes	
CO1	Able to understand the basic concepts of System, System Modeling, Physical Models and Dynamic models.
CO2	Able to understand the basic concepts of Corporate model System Study, Analysis and Design with System Postulation.
CO3	Ability to learn the difference between simulation methods and Analytical methods and study of various numerical techniques for discrete models.
CO4	Ability to learn the Continuous System Simulation and Autopilot simulation.
CO5	Acquainted with the growth models and Delay models, System dynamic diagrams and multi segment models.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	System Models	Concept of System, System Environment, Stochastic Activity, Continuous and Discrete System, System Modeling, Types of Models, Static Physical Models, Dynamic Physical Models, Static Mathematical Models, Dynamic Mathematical Models.	8	CO1
2	System Studies	Subsystem, Corporate Model, Environment Segment, Production Segment, Management Segment, Full Corporate Model, Types of System Study, System Analysis, System Design, System Postulation.	8	CO2
3	System Simulation	Monte Cario Method, Comparison of Simulation and Analytical Methods, Experimental Nature of Simulation, Types of System Simulation, Numerical Computation Technique for Continuous Models, Numerical Computation Technique for Discrete Models, Cobweb Models.	8	CO3
4	Continuous System Simulation	Differential Equations, Analog Methods, Hybrid Computes, Continuous System Simulation Language(CSSLS), CSMP 111, Simulation of an Autopilot, Interactive System, Real Time Simulation.	8	CO4
5	System Dynamic:	Experimental Growth Models, Experimental Delay Models, Modified Experimental Growth Models, Logistic Curves, Generalization of Growth Models, System Dynamic Diagrams, Simple System Dynamic Diagrams, Multi-Segment Models	8	CO5

Reference Books:

1. Geoffrey Gordon, “System Simulation”, PHI.
2. V.P. Singh, “System Modeling and Simulation”, New Age International.
3. A. M. Law, W. David Kelton, “System Modeling and Simulation and Analysis”, TMH.

e-Learning Source:

1. https://nptel.ac.in/courses/108108114
2. https://www.jhuapl.edu/Content/techdigest/pdf/V16-N01/16-01-Menner.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2	1	1		1						2	2				
CO2	3	1	1	1		1							1	2				
CO3	1	2	3	1		2	2						2	2				
CO4		2	2	1	1	2	1						3	2				
CO5	1	1	3			1	2						2	3				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA307	**Title of the Course**	IMAGE PROCESSING	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• To understand basic components that constitutes an image. • To understand concepts of filtering of image. • To understand various processes those are applied on image.						

Course Outcomes	
CO1	Digital Image Fundamentals Element of Visual Perception, A Simple Image Model, Coordinate Conventions, Image Sampling and Quantization,
CO2	Filtering, Smoothing and frequency domain analysis of an image.
CO3	Filtering in Frequency Domain: Fourier Transform and the Frequency Domain, Basics of Gaussian Low pass Filters.
CO4	Image Restoration Process, Least Mean Square Filtering, Blind Image Restoration, Pseudo Inverse, Singular Value Decomposition
CO5	Color Image Processing, Color Segmentation. Morphological Image Processing, Morphological Algorithms: Boundary Extraction, Region Filling

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Digital Image Fundamentals	Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Coordinate Conventions, Image Sampling and Quantization, Basic Relationship between Pixels..	8	CO1
2	Spatial Domain Filtering	Spatial Domain Methods, Basic Grey Level Transformation, Histogram Equalization, Image Subtraction, Image Averaging. Spatial Filtering: Smoothing, Sharpening Filters, Laplacian Filters. Frequency Domain Filters: Smoothing, Sharpening Filters, Homomorphic Filtering.	8	CO2
3	Filtering in Frequency Domain	Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters: Low-pass, High-pass, Correspondence Between Filtering in Spatial and Frequency Domain, Smoothing Frequency Domain Filters: Gaussian Lowpass Filters.	8	CO3
4	Image Restoration Process	Model of Image Degradation/Restoration Process, Noise Models, Inverse Filtering, Least Mean Square Filtering, Constrained Least Mean Square Filtering, Blind Image Restoration, Pseudo Inverse, Singular Value Decomposition	8	CO4
5	Color Image Processing	Color Fundamentals, Color Models, Converting Colors to Different Models, Color Transformation, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms: Boundary Extraction, Region Filling.	8	CO5

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education 2003 2nd Edition.
2. William K, Pratt," Digital Image Processing", John Willey.
3. Millman Sonka, Vaclav Hlavac, "Image Processing Analysis and Machine Vision", Thompson Learning (1999).
4. A.K. Jain, "Fundamentals of Digital Image Processing", PHI.

e-Learning Source:

1. https://nptel.ac.in/courses/108103174
2. https://www.javatpoint.com/digital-image-processing-tutorial

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	2		1		1						2	2				
CO2	1	2	1	1		2							1	2				
CO3	1	2	2	1		2	1						2	1				
CO4		1	3		1	1	2						3	2				
CO5	1	1	3			1	2						1	1				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA308	**Title of the Course**	ALGORITHM ANALYSIS AND DESIGN	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• To study the concepts of complexity of algorithms and understand the analysis of algorithms based on input size. • To learn advanced data structure and their fundamentals for application development. • To learn use of greedy and dynamic programming techniques and their application in the field of computer science to solve problems. • To learn algorithms for graph theory problem like spanning tree problem, single source shortest path and advance features of graph application in field of computer science. • To learn string matching algorithms and, P, NP problem in computer science domain.						

Course Outcomes	
CO1	Understand the algorithms and notation, including order notation, and how to analyze the complexity of the algorithms.
CO2	Understand the concept of hashing and sorting.
CO3	Compare, contrast, and apply the key algorithmic design paradigms: divide and conquer, greedy method, dynamic programming techniques.
CO4	Understand the concepts of Graph algorithms to solve problem using Greedy method as well as dynamic programming techniques
CO5	To understand the concepts of Randomized, and exact vs. approximate. Implement, empirically compare, and apply fundamental algorithms and string matching, P, NP and NP complete real-world problems.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Algorithm Analysis	Asymptotic Notations, Analyze the Asymptotic Performance of Algorithms, Growth of Functions. Complexity of Algorithms: Space and Time Complexity, Analyze Worst-Case, Average and Best-Case Running Times of Algorithms, Compare the Asymptotic Behaviors of Polynomials, Exponential, and logarithmic functions. Recurrences: Substitution Method, Recursion Tree Method, Master's Theorem..	8	CO1
2	Divide and Conquer	**:** Introduction, Problem Solving using Divide and Conquer Algorithm: Binary Search, Merge Sort. Sorting and Order Statistics: Heap Sort, Quick Sort, Sorting in Linear Time: Counting sort. Hash Table: Hash Function, Need for a Good Hash Function, Collision Resolution Techniques, Chaining Method, Linear Probing, Quadratic Probing, Double Hashing.	8	CO2
3	Greedy Method:	Introduction of Greedy Method, Elements of Greedy Strategy, General Characteristics of Greedy Algorithms, Problem Solving using Greedy Algorithm: Activity Selection Problem. Dynamic Programming: Introduction of Dynamic Programming, Principle of Optimality, Problem Solving using Dynamic Programming, 0/1 Knapsack Problem, Matrix Chain Multiplication.	8	CO3
4	Elementary Graph Algorithms	Representations of Graphs, Breadth First Search, Depth First Search, Topological Sort: Introduction to Topological Sorting Algorithm, Spanning tree, Minimum Spanning Trees: Kruskal and Prim's Algorithms, Single Source Shortest Paths: Dijkstra's Algorithm, Bellman-Ford Algorithm.	8	CO4
5	String-Matching	Introduction to String-Matching Problem, Knuth Morris Pratt String Matching Algorithm and its Complexity Analysis. Intractable Problems, Basic Concepts, Non Deterministic Algorithms, NP Completeness, Fundamentals of NP-Hard and NP-Complete Problems.	8	CO5

Reference Books:

1. Coreman, Rivest, Lisserson, "Algorithms", PHI.
2. Horwitz and Sahani, "Fundamental of Computer Algorithm", Galgotia.
3. Brassard Brately, "Fundamental of Algorithms", PHI.

e-Learning Source:

1. https://nptel.ac.in/courses/106105225
2. https://www.tutorialspoint.com/analysis_of_algorithm/index.asp

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2		1		1						1	1				
CO2	3	1				2							3	3				
CO3		2	3	1	1	2	2						2	1				
CO4	3	2	2	1		1	1						3	3				
CO5	2	1	2	1		2	1						2	3				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Coaggregation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA309	**Title of the Course**	KNOWLEDGE MANAGEMENT	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• To learn the basic concepts of KM, establish a foundation of key terms and concepts, historical events and contributions, organizational benefits, and guiding principles on which to build greater understanding of knowledge management. • To learn the life cycle of KM, Knowledge Creation and Knowledge Architecture. • To understand the Capturing Tacit Knowledge to Increase information and understanding about knowledge transfer using low and high technology strategies. • To learn Knowledge Capture Techniques, Knowledge Codification, Case Based Reasoning, Knowledge based Agents, Knowledge Developer's Skill Set. • To study of Quality and Quality assurance rules to implement in System Testing and Deployment, Explore the future of knowledge management and its influence on our jobs, communities, and society.						

Course Outcomes	
CO1	Able to KM, demonstrate an understanding of the history, learning organizations, intellectual capital and related terminologies in clear terms and understand the role of knowledge management in organizations.
CO2	Able to Demonstrate an understanding of the life cycle, concepts, and the antecedents of management of knowledge and describe several successful knowledge management systems.
CO3	Able to Evaluate the impact of technology including telecommunications, networks, and Internet/intranet role in managing knowledge.
CO4	Able to understand how and why a device is designed as it is can be valuable, Economy Ponder KM's current and future impact on individuals, organizations and society at large
CO5	Able to know Quality and Quality Assurance rules. Discuss new jobs, roles and responsibilities.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Working Smarter not Harder	Introduction to Knowledge Management (KM), Knowledge Management Myths, Knowledge Management Life Cycle, Implication for Knowledge Management. Understanding Knowledge Definition of Knowledge, Cognition and Knowledge Management, Data, Information and Knowledge, Types of Knowledge, Human Thinking and Learning, Implication for Knowledge Management.	8	CO1
2	Knowledge Management System Life Cycle	Challenges in Building Knowledge Management System, Conventional Vs Knowledge Management System Life Cycle, Knowledge Management System Life Cycle. Knowledge Creation **a**nd Knowledge Architecture: Knowledge Creation**,** Nonaka's Model of Knowledge Creation and Transfer, Knowledge Architecture	8	CO2
3	Capturing Tacit Knowledge	Evaluating the Expert, Developing the Relationship with Experts, Fuzzy Reasoning and Quality of Knowledge, Interview as a Tool, Guide to Successful Interview, Rapid Prototyping in Interviews	8	CO3
4	Knowledge Capture Techniques	Brainstorming, Protocol Analysis, Nominal Group Technique, Delphi Method and Concept Mapping. Knowledge Codification: Codify, Diagnosis, Instruction, Interpretation, Planning, Prediction, Modes of Knowledge Conversion. Codification Tools and Procedures: Knowledge Maps, Decision Table, Decision Tree, Frames, Production Rules, Case Based Reasoning, Knowledge Based Agents, Knowledge Developer's Skill Set.	8	CO4
5	System Testing and Deployment	Quality and Quality Assurance, Knowledge Testing, Approaches to Logical Testing, Approaches to User Acceptance Testing, Managing the Testing Phase, Knowledge Management System Development, Issues Related to Deployment, User Training and Deployment, Post-Implementation Review. Case Study on Knowledge Management, Knowledge Architecture and Knowledge Codification.	8	CO5

Reference Books:

1.Elias M. Awad, Hassan M. Ghaziri, "Knowledge Management", Pearson Education India**.**

2. Edna Pasher, Tuvya Ronen, "The Complete Guide of Knowledge Management", Willwy publication

3. Elias M. Awad, Hassan M. Ghaziri, "Knowledge Management", Pearson Education India**.**

e-Learning Source:

1. https://www.tutorialspoint.com/knowledge-management/index.asp
2. https://www.hubspot.com/knowledge-management-systems

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2		1		1						1	1				
CO2	3	1	1			1	1						1	1				
CO3		2	1	1	1	2							2	2				
CO4	2	1	2	1		1	1						2	1				
CO5	3	1		1	1	1							1	2				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA310	**Title of the Course**	UNIX AND SHELL PROGRAMMING LAB	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**0**	**0**	**3**	**2**
Pre-Requisite	None	**Co-requisite**	CA302				
Course Objectives	• To describe the UNIX Operating System Architecture and Functionality and differentiate them from other Operating System. • To differentiate between Internal and External Commands and Illustrate Job Control Commands. • To demonstrate Changing of file Permissions and Ownership. • To apply specific UNIX Filter to files and to give output according to user requirement. • To Write a Shell Script for specific problem definition. • To Demonstrate User Input and working with Conditional Statements and Loops. • To Demonstrate Splitting a Line into fields and format the output.						

Course Outcomes	
CO1	To familiarize the Students with the UNIX Operating System Principles, Architecture, and Structure.
CO2	To gain an understanding of important aspects related to the SHELL and Commands.
CO3	To make student learn fundamentals of Shell Scripting and Shell Programming.
CO4	To develop the ability to Formulate Regular Expressions and use them for Pattern Matching.
CO5	To give a Comprehensive Introduction to the Programming, Services and Utilities of SHELL.

Experiment No.	**Title of the Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1.	Unix Commands	Miscellaneous Command, File Management Command, Communication Command, Storage Command, System Status Command	2	CO1
2.	Shell Programming	Shell Script to accept two numbers and perform all arithmetic operations on it. Menu Based Shell Script. Shell Script to calculate the Gross Salary Shell Script through case statement. Shell Script to find the largest among numbers using positional parameters.	2	CO2
3.	System Programming	Use the fork() to create the Process. Use the fork() to create the Child Process.	2	CO3
4.	Loops	Shell Script to illustrate While ,Until and For Loop. Write a shell script to find the factorial of a given number. Write a shell script to check whether the given number is prime or not. Write a shell script to print the Fibonacci series.	2	CO4
5.	Strings	Shell Script to perform String operations.	2	CO5

e-Learning Source:

1. https://www3.cs.stonybrook.edu/~amione/CSE114_Course/materials/resources/unix_lab.html
2. https://unixlabnyuad.github.io/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2		1	1		1						1	1				
CO2	3	1	1			1	2						2	1				
CO3	2	2	1	1	1		1						1	2				
CO4	1	2	3	1		1	1						2	2				
CO5	2	1		1	2	1							1	1				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA311	**Title of the Course**	WEB DESIGNING LAB	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**0**	**0**	**3**	**2**
Pre-Requisite	None	**Co-requisite**	CA304				
Course Objectives	• To learn and apply the basic tags of HTML for creating web pages. • To learn and create web pages using the multimedia tags of HTML. • To learn hyperlink and frame tag and create web pages using them. • To learn JavaScript scripting language and make validations on web pages using JavaScript. • To learn and design websites for clients.						

Course Outcomes	
CO1	Able to create web page(s) using HTML tags.
CO2	Able to create web page(s) using multimedia tags of HTML.
CO3	Able to link and make frames in webpage.
CO4	Able to implement Client Side and Server Side validations of web page using JavaScript.
CO5	Able to create web projects according to latest market needs.

Experiment No.	**Title of the Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Table	Create a CV using table tag.	2	CO1
2	HTML Tag	Create Web Page having one audio and one video file.	2	CO2
3	Frame	Create Web Page using Frame (Only three Frame) also link hyperlinks to its target frame.	2	CO3
4	Java Script	Create JavaScript page and call it to the HTML Page.	2	CO3
5	Multimedia	Create Web Page having Media player with Play stop and Pause.	2	CO2
6	Java Script	Create Web Page to perform calculation on two numbers (Add, Sub, Mul, Div) using JavaScript.	2	CO4
7	Advanced java Java Script	Create Web Page of Student Registration with proper validation using JavaScript.	2	CO4
8	Advanced java Java Script	Create Tic Tac Toe game using JavaScript.	2	CO4
9	Advanced java Java Script	Design and Implement a small website for the University.	2	CO5

Reference Books:

1. Jessica Burdman, "Collaborative Web Development", Pearson Education Asia.
2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", BPB Publication.
3. Mark O'Ncile, "Web Services – Security", TMH.

e-Learning Source:

1. https://www.elegantthemes.com/blog/tips-tricks/7-ways-to-improve-your-web-design-skills-this-year
2. https://mpbou.edu.in/slm/webdeenglish.pdf

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	3		1		1						1	1				
CO2	2	1	2	1	1		1						1	2				
CO3	2	2	2	1	1	1							2	2				
CO4	1	1	3	1		1	1						1	1				
CO5	2	1	3	1	1		2						1	2				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2017-2018							
Course Code	CA312	**Title of the Course**	COMPUTER GRAPHICS AND MULTIMEDIA APPLICATION LAB	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**0**	**0**	**2**	**1**
Pre-Requisite	NONE	**Co-requisite**	CA301				
Course Objectives	• To acquaint the learners with the basic concepts of Computer Graphics. • To learn the various algorithms for generating graphical figures. • To get familiar with mathematics behind the graphical transformations. • To understand and apply various methods and techniques regarding curve and surfaces, clipping etc. • To understand basic concepts of animation.						

Course Outcomes	
CO1	Apply and implement line drawing algorithms to draw line and circle drawing algorithms to draw circle.
CO2	Apply and implement clipping algorithm for given input.
CO3	Apply and implement 2-D transformation algorithms for given input shape.
CO4	Apply and implement algorithm for moving (animate) any 2D, 3D object along with the axis.
CO5	Apply and implement animation concepts for generating simple animation.

Experiment No.	**Title of the Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Scan Conversion	Implement the line drawing algorithm and circle drawing algorithm using midpoint line scan and midpoint circle scan algorithm.	2	CO1
2	Clipping	Write a Program to implement line clipping algorithm.	2	CO2
3	Transformation	Write a Program to implement 2D transformation.	2	CO3
4	Curve	Write a Program to represent curve and surfaces.	2	CO3
5	Animation	Moving (animate) any 2D, 3D object along with the axis.	2	CO3
6	Animation	Application on Audio-Video mixes and clip making.	2	CO4
7	Software Packages	An outline of designing software like Photoshop and CorelDraw.	2	CO4
8	Animation using Flash	Introduction to Flash 5.0 creating a small animation using Flash 5.0.	2	CO5
9	3D Animation	Apply animation on text using Cool 3D.	2	CO5
10	3D Animation	Introduction to creating an animation using 3D Studio Max, Animator Pro, Video Studio Pro.	2	CO5

Reference Books:

1. Foley, Van Dam, Feiner, Hughes, "Computer Graphics Principles and Practice", Addison Wesley.
2. D.J. Gibbs and D.C. Tsichritzs, "Multimedia Programming Object Environment and Framework", LNCS Tutorial.
3. D. Haran and Baker, "Computer Graphics", Prentice Hall of India.

e-Learning Source:

1. https://www.javatpoint.com/computer-graphics-programs
2. https://github.com/AbhishekMali21/COMPUTER-GRAPHICS-LABORATORY

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	3		1	1	1						1	1				
CO2	2	1	3			1	1						2	2				
CO3	1	2	3	2	1	1							2	3				
CO4	2	1	3	1		1	1						3	3				
CO5	2	1	2	1	1	1							1	3				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation