



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA551	Title of the Course	ARTIFICIAL INTELLIGENCE	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> Understand the concepts of AI and searching techniques. To develop the logical skills of knowledge and its representational structure. Understand the concepts of natural language processing. Study the concepts related to machine learning. Learn the concepts how to design the program in PROLOG and pattern recognition techniques. 						

Course Outcomes	
CO1	Study the concepts of AI and related searching algorithms.
CO2	Develop the knowledge skills and its representational structure in AI.
CO3	Study the concepts of natural language processing in AI.
CO4	Study the concepts of supervised/unsupervised machine learning and game technique.
CO5	Study how design the programming skill in PROLOG, and concepts of pattern recognition approaches.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to AI, Uninformed Search Strategies, Informed Search Strategies	Application of AI, Problem, Problem Space and Searches: Problem Characteristics, Simple Problem Solving, Examples, Searching for Solution. Breadth- First Search, Depth-First Search, Depth Limited Search and Iterative Deepening Search. BFS, A* Algorithms, RBFS, Hill-Climbing, Constraint Satisfaction Problem (CSP), Mean-End-Analysis, Optimal Decision in Games	8	CO1
2	Knowledge Representation Concept,	Representation and Mapping, Approaches to Knowledge Representation. Representing Simple Facts in Logic, Computable Functions and Predicates, Rules of Interface, Resolution, Unification and Lifting, Forward and Backward Chaining. Semantic Nets Partitioned Nets, Minsky Frames.	8	CO2
3	Natural Language Processing	Introduction, Overview of Linguistics, Grammar and Languages, Parsing Techniques, Semantic Analysis and Representation Structure, Natural Language Generation, Natural Language Systems, Introduction to Learning and Expert System.	8	CO3
4	Machine Learning, Game Playing	Supervised and Unsupervised Learning, Decision Trees, Statistical Learning models, Learning with Complete Data: Naive Bayes Models, Learning with Hidden Data: EM algorithm, Reinforcement Learning. Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening.	8	CO4
5	Pattern Recognition, Introduction to Prolog	Introduction, Design Principles of Pattern Recognition System, Statistical Pattern Recognition, Parameter Estimation Methods: Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA). Syntax and Numeric Function, Basic List Manipulation Functions in Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Array.	8	CO5

Reference Books:	
1.	Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education.
2.	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill Education Pvt. Ltd.
3.	E. Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education.
4.	Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India.
e-Learning Source:	
1.	https://www.digimat.in/nptel/courses/video/106106126/L01.html
2.	http://www.nitttrc.edu.in/nptel/courses/video/106106126/L02.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	PSO4	PSO5	PSO6	PSO7
CO1	2	3	3	2	2	1	1						2	1				
CO2	1	2	3	1	2		1						1	1				
CO3	1	1		1	1		3						2	1				
CO4	2	1	2	3	1		1						2	1				
CO5	1	2	3	3	2		1						1	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA552	Title of the Course	MACHINE LEARNING WITH PYTHON PROGRAMMING	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	CA567				
Course Objectives	<ul style="list-style-type: none"> To learn and understand different Data sets in implementing the machine learning algorithms. Implement the machine learning concepts and algorithms using python programming. Implement various types of classification methods including SVM, Naive bayes, decision tree, and random forest. Interpret Unsupervised learning and learn to use clustering algorithms Implement linear and polynomial regression, understand ridge and lasso regression 						

Course Outcomes	
CO1	Implement procedures for the machine learning algorithms.
CO2	Design Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms.
CO4	Identify and apply Machine Learning algorithms to solve real world problems.
CO5	Design and develop Python programs to implement linear and polynomial regression.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Machine Learning	Traditional Programming vs Machine Learning, Machine Learning Model, Applications of Machine Learning, Overview of Supervised and Unsupervised Machine Learning, Machine Learning vs Statistical Modeling, Supervised vs Unsupervised Learning, Advantage of using Python libraries for implementing Machine Learning models. Regression: Linear, Non-linear, Simple, Multiple regression and their applications. Evaluate regression model and calculate its accuracy.	8	CO1
2	Machine Learning Algorithms	Classification: Overview of classification techniques, Different classification algorithms; KNN, Decision Trees, Logistic Regression and SVM. Clustering: Clustering approaches. Types of clustering: Partitioned-based Clustering, Hierarchical Clustering and Density-based Clustering	8	CO2
3	Basics of Python Programming, Types, Operators and Expressions	Overview of Python, Using IDLE on Windows, working at the command line or IDE, Basics of Python Programming using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Types: Integers, Strings, Booleans Operators: Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.	8	CO3
4	Data Structures, Functions, Modules	Lists: Operations, Slicing, Methods, Tuples, Sets, Dictionaries, Sequences, Comprehensions. Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Lamda function, Scope of the Variables in a Function - Global and Local Variables. Creating modules, import statement, from Import statement, name spacing.	8	CO4
5	Packages, Standard Library, Object Oriented Programming, Error and Exceptions	Introduction to PIP, Installing Packages via PIP, Python core packages, Using Python Packages. NumPy, Pandas, Analysis of Datasets using Pandas and Matplotlib library. Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding. Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User defined Exceptions.	8	CO5

Reference Books:
1. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'Reilly Media, 1st edition, 2016.
2. M. Gopal, "Applied Machine Learning", McGraw Hill Education, 2019.
3. Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
4. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
e-Learning Source:
1. https://www.geeksforgeeks.org/machine-learning-with-python/
2. https://nptel.ac.in/courses/106105152

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	PSO4	PSO5	PSO6	PSO7
CO1	3	1		1	1	2	2						2	2				
CO2	2	2	1	3	1		1						2	1				
CO3	3	2	2	1	3	1	2						1	2				
CO4	3	1	2		1		2						2	1				
CO5	1	1	3	3	2	1							1	1				

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



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Effective from Session: 2021-2022							
Course Code	CA553	Title of the Course	WEB TECHNOLOGY	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	CA568				
Course Objectives	<ul style="list-style-type: none"> To learn basic concepts of web and web projects. To learn and implement interactive web pages using HTML, CSS. To learn basic concepts of JavaScript and design responsive web pages using HTML, CSS3 and add validation using JavaScript. To learn fundamental concepts of XML and implement XML in Web Applications. To learn basics concepts and syntax of PHP and AJAX. 						

Course Outcomes	
CO1	Able to understand the basic terminology of web and concepts of web projects.
CO2	Hands on practice on HTML and CSS and learn to implement CSS and HTML in web development.
CO3	Understand the concepts and use of JavaScript in web applications.
CO4	Able to use and implement XML in web development.
CO5	Understand the use of PHP as server-side language and application of AJAX in web development.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	History and Growth of Web, Concept of WWW, Protocols Governing the Web, Introduction to Cyber Laws, Concept of Effective Web Design. Web Project, Web Team, Team dynamics, Multi-departmental and Large-scale Website, Technological Advances and Impact on Web Team.	8	CO1
2	HTML, DHTML and CSS	Basics of HTML, Structure of HTML, Formatting tags, Links, List, Tables, Frames, Images, HTML forms, Overview and Features of HTML5. Introduction to CSS, Structure and Syntax of CSS, Internal CSS, External CSS, Inline CSS, Using CSS, Background Images, Colors and Properties, Manipulating Texts, using Fonts, Borders, Padding lists.	8	CO2
3	JavaScript	Introductions to JavaScript, Features, Variables, Documents, Forms, Statements, Functions, Object in JavaScript, Event and Event Handling, DOM, Manipulations using DOM, Form Validation using JavaScript, Combining HTML, CSS and JavaScript.	8	CO3
4	XML	Introduction, Displaying an XML document, Data Interface with an XML document, Document Type Definitions, Internal and External DTD, Parsers using XML, Client-side usage, Server-side usage.	8	CO4
5	PHP, AJAX	Introduction and basic Syntax of PHP, Operator, Variable, String, Decision Making and Looping with examples, PHP and HTML, Basic example of PHP. Introduction to AJAX, AJAX Internals, AJAX Framework. Introduction to COM /DCOM, ASP.	8	CO5

Reference Books:

1. Burdman, "Collaborative Web Development", Addison Wesley.
2. Sharma & Sharma, "Development of E-Commerce Sites," Addison Wesley.
3. Ivan Bayross, "Web Technologies Part II", BPB Publications.
4. Steven Holzer, "HTML Black Book", Dreamtech Press.

e-Learning Source:

1. <http://nptel.ac.in/courses/106105084/11>
2. https://sites.google.com/a/venusict.org/web-application-development/goog_1295399977

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	PSO4	PSO5	PSO6	PSO7
CO1	1	3	1	1	1	2	1						2	1				
CO2	1	1	3	2	2	1	3						2	1				
CO3	1	2	3	2	2	1	3						2	1				
CO4	1	1	3	2	3	2	3						2	2				
CO5	1	3	1	1	1	2	1						2	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA554	Title of the Course	COMPUTER GRAPHICS AND ANIMATION	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	CA569				
Course Objectives	<ul style="list-style-type: none"> To study Computer Graphics and drawing algorithm. To learn Mathematics for Computer Graphics, Segments and Display Files and Windowing and Clipping. To learn use of Computer Graphics Algorithm. To learn Transformation (2D and 3D) and 3D Animation. 						

Course Outcomes	
CO1	Analyze the background processes involved in computer graphics displays, understanding of Algorithms.
CO2	Use Mathematics in Vector. Create Segments and apply clipping to different shapes.
CO3	Understand and apply algorithms used in Computer Graphics.
CO4	Apply methods suitable for 2D and 3D Transformation such as Translation, Rotation, Scaling, Reflection, Shear etc.
CO5	Be able to use 3D Studio Max for Transforming Objects, Pivoting, Aligning, Snapping and Cloning Objects.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Computer Graphics	Definition, Application, Pixel and Frame Buffer, Raster and Random Scan Display, Display Devices: CRT, Color CRT Monitors, Scan Conversion of Line, DDA Algorithm of Line Drawing, Bresenham's Line Algorithm, Midpoint Circle Algorithm, Polygon Filling, Scan Line Polygon Filling Algorithm, Flood Fill Algorithm and Boundary Fill Algorithm.	8	CO1
2	Mathematics for Computer Graphics, Segments and Display Files, Windowing and Clipping	Point Representation, Vector Representation, Matrices and Operations Related to Matrices, Vector Addition and Vector Multiplication, Scalar Product of two Vectors, Vector Product of two Vectors. Segment Table, Creating, Deleting, and Renaming Segments. Window to View Port Transformation, Point Clipping, Line Clipping (Cohen Sutherland Line Clipping, Liang Barsky Line Clipping Algorithm), Polygon Clipping, Sutherland and Gary Hodgman Polygon Clipping Algorithm.	8	CO2
3	Computer Graphics Algorithm	Hidden Surface Removal, Depth Comparison, Z-Buffer Algorithm, Back-Face Removal, The Painter's Algorithm, Scan-Line Algorithm, Light and Color, Different Color Models: RGB, CMY, YIQ, Spline and Bezier Representation, Interpolation and Approximation Splines, Hermite Interpolation.	8	CO3
4	Transformation (2D and 3D)	2-Dimensional Transformation: Translation, Rotation, Scaling, Matrix Representation and Homogeneous Coordinate, Composite Transformation including General Pivot Point Rotation, General Fixed-Point Scaling, Reflection, Shearing. 3-Dimensional Transformation: Translation, Rotation, Scaling, Reflection, Shear.	8	CO4
5	3D Animation	Introduction to 3D Studio Max, Exploring the Max Interface, Controlling and Configuring the View Ports, Working with Files, Importing and Exporting, Creating and Editing Primitive Objects, Selecting and Setting Object Properties, Transforming Objects, Pivoting, Aligning, Snapping and Cloning Objects, Grouping and Linking Objects.	8	CO5

Reference Books:	
1.	Donald Hearn and M Pauline Baker, "Computer Graphics", PHI.
2.	Kelly L. Murdock, "3ds Max-Bible 2011", Wiley Publications.
3.	Steven Harrington, "Computer Graphics: A Programming Approach", TMH.
4.	Prajapati A.K., "Computer Graphics", Pragati Prakashan Ed2.
e-Learning Source:	
1.	https://nptel.ac.in/courses/106106090
2.	https://onlinecourses.nptel.ac.in/noc20_cs90/

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	PSO4	PSO5	PSO6	PSO7
	CO1	3	1			1	1							1	2			
CO2	1	3	1	2	1								2	2				
CO3	2	3		2	1	1							2	1				
CO4	1	2	2	1		2	1						2	2				
CO5		3	1	2	1	2							2	1				

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



Integral University, Lucknow

Effective from Session: 2020-2021							
Course Code	CA555	Title of the Course	CLOUD COMPUTING	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To learn basic concepts, types and characteristics of cloud computing To learn Cloud Computing Architecture and service models. To learn Virtualization and its types in cloud computing. To learn fundamental concepts and architecture of cloud computing security. To learn basics of SOA and cloud-based storage 						

Course Outcomes	
CO1	Able to understand basic concepts, principles and paradigm of Cloud Computing
CO2	Able to interpret various Cloud computing models and services.
CO3	Able to identify the significance of implementing virtualization techniques.
CO4	Able to understand the need of security in Cloud computing.
CO5	Understand the concept SOA and cloud-based storage in Cloud computing.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Overview of Computing Paradigm	Grid Computing, Cluster Computing, Distributed Computing, Utility Computing and Cloud Computing, Evaluation to Cloud Computing. Introduction to Cloud Computing: Defining Cloud Computing. Cloud Types: The NIST Model, Cloud Cube Model, Deployment Models and Service Models. Characteristics of Cloud Computing: Paradigm Shift, Benefits of Cloud Computing, Disadvantages of Cloud Computing, Assessing the Role of Open Standards.	8	CO1
2	Cloud Computing Architecture	Comparison with Traditional Computing Architecture (Client/Server), Cloud Computing Stack, Connecting to the Cloud. Introduction to Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Defining Identity as a Service (IDaaS) and Defining Compliance as a Service (CaaS).	9	CO2
3	Abstraction and Virtualization	Virtualization and Cloud Computing, Types of Hardware Virtualization: Full, Partial and Para. Virtualization: Software Virtualization, Memory Virtualization, Storage Virtualization, Data Virtualization and Network Virtualization, Load Balancing, Abstraction Technique using Hypervisors, Machine Imaging. Capacity Planning: Defining Baseline and Metrics, Network Capacity, Scaling	9	CO3
4	Cloud Security	Cloud Security Fundamentals, Security Boundary, Security Service Boundary and Security Mapping. Securing Data: Brokered Cloud Storage Access, Storage Location and Tenancy, Encryption, Auditing and Compliance. Cloud Computing Security Architecture: Architectural Consideration, General Issues, Trusted Cloud Computing. Establishing Identity and Presence: Identity Protocol Standards, Windows Azure Identity Standards and Presence.	8	CO4
5	Service Oriented Architecture (SOA)	Introduction to SOA, Defining SOA Communications, Managing and Monitoring SOA, Relating SOA and Cloud Computing. Cloud Based Storage: Measuring the Digital Universe, Provisioning Cloud Storage, Exploring Cloud Backup Solutions and Cloud Storage Interoperability.	8	CO5

Reference Books:	
1.	Barrie Sosinsky, "Cloud Computing Bible", Wiley India, 2010.
2.	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.
3.	Nikos Antonopoulos, Lee Gillam, "Cloud Computing: Principles, Systems and Applications", Springer, 2012.
4.	Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley-India, 2010.
e-Learning Source:	
1.	https://nptel.ac.in/courses/106105167
2.	https://onlinecourses.nptel.ac.in/noc22_cs20/

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	PSO4	PSO5	PSO6	PSO7
CO1	3	1			1	1		1			1		2	1				
CO2	1	2	1	3	1		1						1	2				
CO3		1	3	1	2	1		1					2	1				
CO4	2	1	2	1		2	1						2	1				
CO5		1	1	2	1	2		1					2	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA556	Title of the Course	ADVANCED CONCEPTS IN DATABASE SYSTEM	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To study Query Processing, Optimization and Database Tuning. To learn Extended Relational Model. To learn use of Distributed Database System. To learn Enhanced Data Model for particular databases and its application. To learn concept of Expert Database and Fuzzy Database System. 						

Course Outcomes	
CO1	Analyze the background processes involved in queries and transactions, assess and apply database query optimization.
CO2	Create and use new database data types. Apply Data Log for Logic Based and Expert Database Model.
CO3	Understand issues surrounding concurrency control and recovery in distributed database systems data management.
CO4	Explain methods suitable for particular types of data such as temporal, multimedia or spatial data.
CO5	Be able to develop new methods to store and index data for expert and fuzzy databases based on knowledge of existing techniques

Unit No.	Title of the Unit	Content of Unit	ContactHrs.	Mapped CO
1	Query Processing, Optimization and Database Tuning	Algorithms for Executing Query Operations, Heuristics for Query Optimizations, Estimations of Query Processing Cost, Join Strategies for Parallel Processors, Database Workloads, Tuning Decisions, DBMS Benchmarks, Clustering and Indexing, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations, System Catalogue in RDBMS.	8	CO1
2	Extended Relational Model and Object Oriented Database System	New Data Types, User Defined Abstract Data Types, Structured Types, Object Identity, Containment, Class Hierarchy, Logic Based Data Model, Data Log, Nested Relational Model and Expert Database System	8	CO2
3	Distributed Database System	Structure of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel and Pipeline Join, Distributed Query Processing in R * System, Concurrency Control in Distributed Database System, Recovery in Distributed Database System, Distributed Deadlock Detection and Resolution, Commit Protocols.	8	CO3
4	Enhanced Data Model for Advanced Applications	Database Operating System, Introduction to Temporal Database Concepts, Spatial and Multimedia Databases, Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues in Real Time Database Design	8	CO4
5	Introduction to Expert Database and Fuzzy Database System	Expert Databases, Using the Rules of Deduction in Databases, Recursive Rules. Fuzzy Databases: Fuzzy Set and Fuzzy Logic, Use of Fuzzy Techniques to Define Inexact and Incomplete Databases.	8	CO5

Reference Books:	
1.	Majumdar and Bhattacharya, "Database Management System", TMH.
2.	Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
3.	Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley.
4.	Data C J, "An Introduction to Database System", Addison Wesley.
e-Learning Source:	
1.	https://nptel.ac.in/courses/106105175
2.	https://onlinecourses.nptel.ac.in/noc22_cs51/

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	PSO4	PSO5	PSO6	PSO7
	CO1	2	3	2	1			1						2	1			
CO2	1	2			2								2	1				
CO3	3	2	2	2			2						2	1				
CO4	1	3	2		2								2	1				
CO5	3	2	3		3		1						2	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA557	Title of the Course	E-COMMERCE	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To give knowledge of e-commerce with its technology, need, pros & cons, model, impacts, sales life cycle along with its implementation in India. To offer practical knowledge of infrastructure and technologies used in e-commerce and mobile commerce. To provide the knowledge of security aspects used in e-commerce and mobile commerce. To build the knowledge for ensuring the implementation of secure information using encryption techniques and digital signature in e-commerce and mobile commerce. To build the concept of the process of electronic payment in e-commerce along with different technologies, policies and governments law. 						

Course Outcomes	
CO1	Gain knowledge of e-commerce with its technology, need, pros & cons, model, impacts, sales life cycle along with its implementation in India.
CO2	Understand practical knowledge of infrastructure and technologies used in e-commerce and mobile commerce.
CO3	Learn about the knowledge of security aspects used in e-commerce and mobile commerce.
CO4	Apply knowledge for ensuring the implementation of secure information using encryption techniques and digital signature in e-commerce and mobile commerce.
CO5	Understand the concept of the process of electronic payment in e-commerce along with different technologies, policies and governments law.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Definition of Electronic Commerce, E-Commerce: Technology and Prospects, Incentives for Engaging in Electronic Commerce, Needs of E-Commerce, Advantages and Disadvantages, Framework, Impact of E-commerce on Business, E-Commerce Models, E-Commerce Process Models: Introduction, Business Models, E-business Models based on the Relationship of Transaction Parties, E-Commerce Sales Life Cycle (ESLC) Model, Roadmap of E-Commerce in India.	8	CO1
2	Network Infrastructure for E- Commerce, Mobile Commerce	Internet and Intranet based E-commerce- Issues, Problems and Prospects, Network Infrastructure, Network Access Equipment's, Broadband Telecommunication (ATM, ISDN, and FRAME RELAY). Introduction, Wireless Application Protocol, WAP Technology, Mobile Information Device.	8	CO2
3	Web Security	Security Issues on Web, Importance of Firewall, Components of Firewall, Transaction Security, Emerging Client Server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.	8	CO3
4	Encryption	Encryption Techniques, Symmetric Encryption: Keys and Data Encryption Standard, Triple Encryption, Secret Key Encryption, Asymmetric Encryption: Public and Private Pair Key Encryption, Digital Signatures, Virtual Private Network.	8	CO4
5	Electronic Payments	Overview, The SET Protocol, Payment Gateway, Certificate, Digital Tokens, Smart Card, Credit Card, Magnetic Strip Card, E-Checks, Credit/Debit Card based EPS, Online Banking, EDI Application in Business, E- Commerce Law, Forms of Agreement, Govt. Policies and Agenda.	8	CO5

Reference Books:	
1.	Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison- Wesley.
2.	Pete Lohsin , John Vacca "Electronic Commerce", New Age International.
3.	Goel, Ritendra "E-commerce", New Age International.
4.	Laudon, "E-Commerce: Business, Technology, Society", Pearson Education.
e-Learning Source:	
1.	https://nptel.ac.in/courses/110/105/110105083/
2.	https://onlinecourses.nptel.ac.in/noc19_mg54/

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	PSO4	PSO5	PSO6	PSO7
	CO1	3	1		1		1							2	1			
CO2	2	2	1	2	1		1						2	1				
CO3	2		3	1	2		1						1	1				
CO4	1	2	3	2	1		1						2	2				
CO5	2	1	2	1		1	1						1	1				

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



Integral University, Lucknow

Effective from Session: 2020-2021							
Course Code	CA558	Title of the Course	REAL TIME SYSTEMS	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To understand basics knowledge real time system and its classification. To learn various task scheduling mechanism. To learn various algorithm for task assignment and scheduling. To learn basic concept of fault tolerance techniques used in real time system. To understand real time communication in real time system. 						

Course Outcomes	
CO1	Examine the issues in real time system and their classification.
CO2	To solve various scheduling problems and will be able to apply them in real time applications.
CO3	Develop and implement appropriate algorithm for task assignment in real time system and able to understand the possibility of scheduling a task set.
CO4	Analyze the condition of fault occurrence and apply solutions consequently.
CO5	Address the issues in real time system.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction to Real Time Systems, Structure of Real Time System, Various Classification of Real Time Systems, Embedded System, Characterizing Real Time System Task, Various Issues in Real Time Systems, Real Time OS: Threads and Tasks, Kernel, Case Study of Maruti II, HART OS, VRTX.	8	CO1
2	Task Scheduling	Classical Uniprocessor Scheduling Algorithm, Rate Monotonic, EDF, Uniprocessor Scheduling of IRIS Tasks: Identical and Non-Identical Linear and Concave Reward Function, 0/1 Reward Function.	8	CO2
3	Task Assignment and Scheduling	Task Assignment Algorithms, Utilization Balancing, A Next Fit Algorithm for RM Scheduling, A Myopic Offline Scheduling, FAB Algorithm and Buddy Strategy. Real Time Database: Real Time Vs General Purpose Database, Main Memory Database, Concurrency Control Issues.	8	CO3
4	Fault Tolerance Techniques	Introduction, Fault, Fault Detection and Error Containment, Redundancy Data Diversity, Reversal Checks, Malicious and Integrated Failure Handling, Clock Synchronization: Introduction, Clocks, A Non-Fault Tolerant Synchronization Algorithms, Impact of Fault, Fault Tolerant Synchronization in H/Wand S/W.	8	CO4
5	Real Time Communication	Introduction, N/W Topologies, Protocols: Internet and Resource Reservation Protocols, Real Time Protocol, Contention Based Protocol.	8	CO5

Reference Books:
1. C.M. Krishna and Shin, "Real Time Systems", McGraw Hill 1985.
2. Jane W.S. LIU, "Real Time Systems", Pearson Education.
3. Levi and Agarwal, "Real Time System", McGraw Hill.
4. Mathi and Joseph, "Real Time System: Specification, Validation and Analysis", PHI.

e-Learning Source:
1. https://onlinecourses.nptel.ac.in/noc21_cs98/
2. https://nptel.ac.in/courses/106105229

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	PSO4	PSO5	PSO6	PSO7
CO1	2	1		3	1	1							2	2				
CO2	2	1	1	3	1								2	1				
CO3	1		3	2	1	1		1					2	1				
CO4	1	3	1	2		2	1						1	2				
CO5		1	1	2	1	2		1					2	1				

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



Integral University, Lucknow

Effective from Session: 2020-2021							
Course Code	CA559	Title of the Course	SOCIAL NETWORK ANALYSIS AND EVOLUTIONARY COMPUTING	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To learn the basic knowledge, Limitations, Development and Emergence of Social Web. To learn the statistical properties of Social Network Analysis, Blogs, Online communities and Web-Based networks. To learn Visualization of Social Networks. To learn the Community mining and core methods for community detection and mining. To learn the algorithms for Social Influence analysis. To learn the basics of text mining in Social Network. To learn the concepts of Evolutionary Computing, Evolutionary Algorithms and Evolutionary Programming. To learn how to work with evolutionary algorithms. To learn the basic concepts of Genetic Algorithms and Genetic Programming. 						

Course Outcomes	
CO1	Able to understand the basic concepts of Web, Emergence of Social Web, Statistical properties and key concepts and measures in Network analysis.
CO2	Ability to define the visualization of Online Social Networks, Graph Representation, Clustering and modeling and aggregating Social Network data.
CO3	Able to detect the Communities in Social Networks, Algorithms for Social Influence analysis and expert location in Social Networks along with text and opinion mining.
CO4	Able to understand the basic concepts in Evolutionary Computing, working with evolutionary algorithms and parent selection and Survivor selection in evolutionary programming.
CO5	Able to understand the working of evolutionary algorithms, basic concepts of Genetic Algorithms and Genetic programming.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction to Web, Limitations of Current Web, Development of Semantic Web, Emergence of the Social Web, Statistical Properties of Social Networks, Network Analysis, Development of Social Network Analysis, Key Concepts and Measures in Network Analysis, Discussion Networks, Blogs and Online Communities, Web Based Networks.	8	1
2	Modeling and Visualization	Visualizing Online Social Networks, A Taxonomy of Visualizations, Graph Representation, Centrality, Clustering, Node Edge Diagrams, Visualizing Social Networks with Matrix Based Representations, Node Link Diagrams, Hybrid Representations, Modeling and Aggregating Social Network Data, Random Walks and their Applications.	8	2
3	Mining Communities	Aggregating and Reasoning with Social Network Data, Advanced Representations, Extracting Evolution of Web Community, Detecting Communities in Social Networks, Core Methods for Community Detection and Mining. Evolution: Evolution in Social Networks, Framework, Models and Algorithms for Social Influence Analysis, Algorithms and Systems for Expert Location in Social Networks. Text and Opinion Mining: Introduction to Text Mining in Social Network.	8	3
4	Introduction to Evolutionary Computing	Introduction to Evolutionary Algorithm, Evolutionary Programming, Parameter Control in Evolutionary Algorithms, Special Forms of Evolution, Working with Evolutionary Algorithms. Evolutionary Algorithms: Components of Evolutionary Algorithms, Representation (Definition of Individuals), Evaluation Function (Fitness Function), Population, Parent Selection Mechanism, Variation Working of an Evolutionary Algorithm, Evolutionary Computing and Global Optimization. Evolutionary Programming: Recombination, Parent Selection, Survivor Selection.	8	4
5	Working with Evolutionary Algorithms	Performance Measures, Test Problems for Experimental Comparisons, Example Applications. Introduction to Genetic Algorithm: Mutation, Recombination, Population Models, Parent Selection, Survivor Selection. Introduction to Genetic Programming: Basic Concepts, Bloat in Genetic Programming Problems Involving "Physical" Environments, Example Application: Symbolic Regression.	8	5

Reference Books:

1. Charu C. Aggarwal, "Social Network Data Analytics", Springer 2011.
2. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st Edition, 2007
3. A.E.Eiben, J.E Smith, "Introduction to Evolutionary Computing", Springer.
4. BorokoFurht, "Handbook of Social Network Technologies and Applications", Springer, 1st Edition, 2010.
5. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and Applications", Springer, 1st Edition, 2011.
6. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.

e-Learning Source:

1. https://onlinecourses.nptel.ac.in/noc22_cs117/
2. <https://www.digimat.in/nptel/courses/video/106106169/L01.html>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1	2	1		3	1	1							2	1				
CO2	2	1	1	3	1								2	2				
CO3	1		3	2	1	1							2	1				
CO4	1	3	1	2		2	1						2	1				
CO5		1	1	2	1	2							2	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA560	Title of the Course	EMBEDDED SYSTEM	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> Understand the basic concepts, and building blocks of embedded System. To learn the internal architecture and programming concept of 8051. To introduce the advanced concepts on embedded system. To learn the introduction on RTOS, and aspects required in developing a new embedded processor 80386, 80486. To introduce the microprocessor interfacing and related concepts. 						

Course Outcomes	
CO1	An ability to introduce the basic terminology in embedded system to meet desired needs within realistic constraints.
CO2	Describe the 8051 internal architecture and programming.
CO3	An ability to design the embedded system.
CO4	Ability to understand the advanced processor architecture and concept of RTOS.
CO5	Describe the microprocessor interfacing and various protocols.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Basic Terms in Embedded System	Introduction to Microcontrollers and Microprocessors, Embedded versus external memory devices, CISC and RISC processors, Harvard and Von Neumann Architecture, 8051 Microcontrollers-Assembly Language, Architecture of 8051, Registers, Addressing Modes, Instruction Set.	8	CO1
2	8051 Internal Architecture and Programming	I/O ports, Memory Organization, Programs showing use of I/O Pins, Interrupts, Interrupt Programming, Timer and Counters, Serial Communication, Programming of Serial Communication.	7	CO2
3	Introduction of Embedded System	Application of Embedded System, Embedded Operating System, Design Parameters of Embedded and its Significance, Design Life Cycle, Hardware fundamentals, Digital circuit parameter, O.C and Tristate outputs, I/O sink and Source, Custom single purpose processor optimization, FSMD, Data path and FSM, General purpose Processor and ASIP'S.	9	CO3
4	Introduction to RTOS	Tasks, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes, Advanced processor (Only Architecture), 80386, 80486, ARM	8	CO4
5	Microprocessor Interfacing	I/O addressing, Direct memory access (DMA), Arbitration, Multilevel bus Architecture, Serial Protocol, Parallel Protocols and Wireless Protocol, Real world interfacing: LCD, Stepping motor, ADC, DAC, LED, Pushbuttons, Keyboard, Latch connection, PPI.	8	CO5

Reference Books:

- Frank Vahid, Tony Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", John Wiley & Sons, USA, 2011.
- Ajay V Deshmukh, "Microcontrollers: Theory and Applications", Tata McGrawHill Education, India, New Delhi, 2005.
- David E.Simon, "An Embedded Software Primer", Pearson Education.
- Muhammad Ali Mazidi and Janice Gillispie, "The 8051 Microcontroller and embedded systems", Pearson Prentice Hall; 2nd edition.

e-Learning Source:

- <https://nptel.ac.in/courses/108102045>
- <https://archive.nptel.ac.in/courses/106/105/106105193/>

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	PSO4	PSO5	PSO6	PSO7
CO1	1	1											2	1				
CO2	2	3	2	3			2		1		1		2	1				
CO3	2	3	3	3			2		2				2	2				
CO4	2	3	3	2			1		1		1		2	1				
CO5	1	3	1						1		1		1	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA561	Title of the Course	INTERNET OF THINGS	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	CA561				
Course Objectives	<ul style="list-style-type: none"> To know the basic the concepts IOT architecture, its motivation and overview of the features involved during the process of communication over the channel. To understand the basic designing of IOT to know the requirement of general bodies or standard bodies To learn about the structural aspects and identification regarding the objects and services used worldwide. To understand the concept of key technologies those are used so far in IOT. To deal with different technological challenges in design issues those are governed with respect to the product codes. To learn the security challenges also in order to make secure environment using different integrating approaches and data link protocols To understand significance of software agents for representing respective objects using clustering principles. To understand the idea regarding the identity management for and by the customers with the help of different models. To draw elementary knowledge regarding security requirements for smart metering and automotive applications. 						

Course Outcomes	
CO1	As per the new technology, a student should perform data transfer operations using IOT that help the students to guide in a formal way to communicate over new IOT devises within a short span of time. He/she should be able to develop new ideas for new frameworks using basic nodal capabilities.
CO2	For a given situation, a student should be able to deal with different structural aspects of designing and he/she can shall know the use of key technologies that would be used by the students to promote the development of a coherent learning program
CO3	With the enhancement in technology, IOT deals with the challenges and unique product codes for a particular product so a student should be able to tackle the unique codes and he/she should development different approaches that can continue the legacy of an organization.
CO4	During clustering phenomena, a student should be prepared to deal with principles and policies governed according to the company rules so as to provide better identity management using different models like isolated and federated user identity models
CO5	A student should know the basic idea of security requirements and vulnerabilities in IOT. He/she should be good enough to deal with the establishment of identity for smart applications to be used in IOT

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction, Definitions and Frameworks	Basics of IoT, History of IoT, Overview and Motivations, Characteristics of IoT, Physical and Logical Design of IoT. IoT Definitions, IoT Architecture, General Observations, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities.	8	CO1
2	Fundamental IoT Mechanisms and Key Technologies, RFID	Identification of IoT Objects and Services, Structural Aspects of IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, Satellite Technology. Introduction, Principle of RFID, Components of an RFID system, Issues.	8	CO2
3	EPC Global Architecture Framework, Wireless Sensor Networks, WSN Specific IoT Applications and Challenges	EPCIS and ONS, Design Issues, Technological Challenges, Security Challenges, IP for IoT, Web of Things. History and Context, WSN Architecture, Connecting Nodes, Networking Nodes, Securing Communication. Security, QoS, Configuration, Various Integration Approaches, Data Link Layer Protocols, Routing Protocols and Infrastructure Establishment.	8	CO3
4	Resource Management in IoT, Identity Management Models	Clustering, Software Agents, Clustering Principles in IoT Architecture, Design Guidelines and Software Agents for Object Representation, Data Synchronization, Identity Portrayal. Identity Management, Local, Network, Federated and Global Web Identity, User-Centric Identity Management, Device-Centric Identity Management and Hybrid-Identity Management, Identity and Trust.	8	CO4
5	IoT Privacy, Security and Governance, IoT Application	Introduction to 3D Studio Max, Exploring the Max Interface, Controlling and Configuring the View Ports, Working with Files, Importing and Exporting, Creating and Editing Primitive Objects, Selecting and Setting Object Properties, Transforming Objects, Pivoting, Aligning, Snapping and Cloning Objects, Grouping and Linking Objects.	8	CO5

Reference Books:
1. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3642-19156-5 e-ISBN 978-3-642-19157-2, Springer.
2. arikshit N. MahalleandPoonam N. Railkar, "Identity Management for Internet of Things", River Publishers, ISBN: 978-87-93102-90-3 (Hard Copy), 978-87-93102-91-0 (ebook).
e-Learning Source:
1. https://onlinecourses.nptel.ac.in/noc22_cs53/
2. https://www.digimat.in/nptel/courses/video/106105166/L01.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	PSO4	PSO5	PSO6	PSO7
CO1	3	1		2	1	1	1							2	1			
CO2	1	2	1	2	1		1							1	1			
CO3	2	1		2	1	1								2	1			
CO4	1	2	1	1		2	1							2	2			
CO5	2		1	2	1	2	1							1	1			

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA562	Title of the Course	NATURAL LANGUAGE PROCESSING	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To introduce the fundamental concept and techniques of Natural Language Processing To be able to map the appropriate techniques with the problem and solve real world problems. 						

Course Outcomes	
CO1	Basics of text components and text processing.
CO2	To differentiate among different techniques while considering different plus and minus of each technique.
CO3	To classify text, reduce Dimensionality, use different Topic Modelling Approaches and Algorithms.
CO4	Ability to understand the advanced processor architecture and concept of RTOS.
CO5	Analyze text data from different real-world situations.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Natural Language Processing	Natural Language Processing: Introduction, Text, Textual Sources and Formats. Finding Structure of Words: Words and their Components, Tokenization, N-grams and Scriptio continua, Stemming and Lemmatization, POS Tagging and Stop words. Finding Structure of Documents: Introduction, Methods, Complexity and Performance of Approaches.	8	CO1
2	Vector	Vector- Globe and word2vec. Dimensionality Reduction: Singular Vector Reduction (SVG), Principal Component Analysis (PCA), t-distributed stochastic neighbor embedding (t-SNE). Topic Modelling Approaches: Latent Semantic Indexing (LSI), Latent Dirichlet Allocation (LDA). Document Similarity Matrices: Jaccard Distance, Cosine Similarity, Mutual Information, Point wise Mutual Information, Entropy, Euclidian distance, Manhattan Distance.	8	CO2
3	Syntax Analysis	Syntax Analysis: Parsing Natural Language. Treebanks: Data-Driven approach to syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual issues. Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems and Software.	8	CO3
4	Discourse Processing	Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure. Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modelling, Problems, Multilingual and Cross lingual Language Modelling.	8	CO4
5	Knowledge Representation and Reasoning	Knowledge Representation and Reasoning: Local Discourse Context and Reference, Using World Knowledge, Discourse Structure, Defining a Conversational Agent. Applications: Machine Translation, Information Retrieval and Extraction, Text Categorization and Summarization	8	CO5

Reference Books:	
1.	Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and ImedZitouni, Pearson Publication.
2.	Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.
3.	Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Prentice Hall, 2nd Edition, 2008.
4.	Manning and H. Schutze, “Foundations of Statistical Natural LanguageProcessing”, MIT Press. Cambridge, MA:, 1999.
e-Learning Source:	
1.	https://nptel.ac.in/courses/106105158
2.	https://www.javatpoint.com/nlp

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	PSO4	PSO5	PSO6	PSO7
	CO1	1	2		1		1	1						1	1			
CO2	1	3		2		1							1	2				
CO3	1	2		1		1	1						1	1				
CO4	3		1	1									2	1				
CO5		3	1		2	1							1	2				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA563	Title of the Course	NEURAL NETWORKS	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> Understand the concepts of neural network and perception training Algorithm with modification. To develop the skills of supervised and unsupervised learning concepts. Understand the concepts of natural network architecture. Study the concepts related to SOM, and PC. Learn the concepts FUZZY technique and soft computing. 						

Course Outcomes	
CO1	Study the concepts of neural network and some related problems.
CO2	Develop the knowledge supervised and unsupervised.
CO3	Study the concepts of architecture of Neural network.
CO4	Learn the concepts of principle component and SOM.
CO5	Develop the skills on FUZZY techniques, soft computing and concepts of CVNN, CVBP.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Neural Networks	Neural Networks: Terminology, Neural Network Architecture, Perceptron's, Linear Separability. Perceptron Training Algorithm: Termination Criteria, Choice of Learning Rate, Non-numeric Input. Modifications: Pocket Algorithm.	8	CO1
2	Supervised and Un Supervised Learning	Supervised/Unsupervised Learning: Prediction Networks, Winner-Take-All Networks, Hamming Networks, Max Net, Simple Competitive Learning, Counter Propagation, Neo Cognition. Associative Models: Hopfield Network, Brain-State-in-a-Box Network, Boltzmann Machines. [8]	8	CO2
3	Accelerated Learning BP	Multilayered Network Architecture, Back Propagation Algorithm, Heuristics for Making Algorithm. Accelerated Learning BP: Recursive Least Square, Quick Prop, RPROP Algorithm, Approximation Properties of RBF Networks, Comparison with Multilayer Perceptron.	8	CO3
4	Recurrent Network	Recurrent Network, Temporal Feed-forward Network, Implementation with BP, Self-Organizing Map and SOM Algorithm, Properties of Feature Map and Computer Simulation, Principal Component, Independent Component Analysis, Application to Image and Signal Processing. [8	CO4
5	Complex Valued NN	Complex Valued NN, Complex Valued BP, Analyticity of Activation Function, Application in 2D Information Processing, Complexity Analysis of Network Models, Soft Computing, NeuroFuzzy-Genetic Algorithm Integration	8	CO5

Reference Books:	
1.	K. Mehrotra, Mohan, Ranka "Elements of Artificial Neural Networks", Penram International Publishing.
2.	J.A. Anderson, "An Introduction to Neural Networks", MIT.
3.	Hagen Demuth Beale, "Neural Network Design", Cengage Learning.
4.	Laurene V. Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms and Applications", Pearson India.

e-Learning Source:	
1.	https://www.javatpoint.com/artificial-neural-network
2.	https://nptel.ac.in/courses/117105084

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	PSO4	PSO5	PSO6	PSO7
CO1	3	1		2		1	1						2	1				
CO2	2		2	1	1		1						1					
CO3	2	1		2	1	1							2	1				
CO4	3	2	1	1		2	1						1					
CO5	1	1	3		2		1						1	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA564	Title of the Course	SOFT COMPUTING	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To study the concepts Neuro, Fuzzy and Soft Computing and understand the Input Space partitioning and Fuzzy Modeling. To learn: Derivative-based Optimization and Simulated Annealing, Random Search, Downhill Simplex Search and their application development. To learn Supervised Learning Neural Networks and Unsupervised Learning Neural Networks their application in the field of computer science to solve problems. To learn Neuro Fuzzy Modeling, Methods that Cross-fertilize ANFIS and RBFN and Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. To learn Genetic Algorithm and understand the Working Principle, Procedure of GA, Flow chart of GA, Genetic Representations, Encoding, Application of GA. 						

Course Outcomes	
CO1	Understand the concepts of Neuro, Fuzzy and Soft Computing and understand the Input Space partitioning and Fuzzy Modeling.
CO2	Understand the concept of Derivative-based Optimization and Simulated Annealing, Random Search, Downhill Simplex Search and their application development.
CO3	Understand the concept of Supervised Learning Neural Networks and Unsupervised Learning Neural Networks their application in the field of computer science to solve problems.
CO4	Understand the concepts of Neuro Fuzzy Modeling, Methods that Cross-fertilize ANFIS and RBFN and Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum.
CO5	To understand the concepts of Genetic Algorithm and understand the Working Principle, Procedure of GA, Flow chart of GA, Genetic Representations, Encoding, Application of GA.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Fuzzy Set Theory	Fuzzy Set Theory: Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle, Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning, Fuzzy Modeling.	8	CO1
2	Optimization	Optimization: Derivative-based Optimization, Descent Methods, Steepest Descent Method, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Simulated Annealing, Random Search, Downhill Simplex Search.	8	CO2
3	Neural Networks	Neural Networks: Supervised Learning Neural Networks, Perceptron's, Adaline, Back Propagation Multilayer Perceptron's, Radial Basis Function Networks, Unsupervised Learning Neural Networks, Competitive Learning Networks, Kohonen Self-Organizing Networks, Learning Vector Quantization, Hebbian Learning.	8	CO3
4	Neuro Fuzzy Modeling	Neuro Fuzzy Modeling: Adaptive Neuro, Fuzzy Inference Systems, Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum.	8	CO4
5	Genetic Algorithm	Genetic Algorithm: Fundamentals of Genetic Algorithms, Basic Concepts, Working Principle, Procedure of GA, Flow chart of GA, Genetic Representations, Encoding, Application of GA.	8	CO5

Reference Books:

1. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
3. K. Mehrotra, Mohan, Ranka "Elements of Artificial Neural Networks", Penram International Publishing.
4. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997

e-Learning Source:

1. <https://nptel.ac.in/courses/106105173>
2. <https://elearn.nptel.ac.in/shop/nptel/introduction-to-soft-computing/>

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	PSO4	PSO5	PSO6	PSO7
CO1	3	1		1	1	1								1	1			
CO2	2	1	1	2	1		1			1				2	1			
CO3	2	1		1	1	1		1						2	1			
CO4	2		1	2		2	1							1	1			
CO5	2		1	2	1	2		1						1	1			

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA565	Title of the Course	VIRTUAL REALITY	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To give historical and modern overviews and perspectives on virtual reality. To give the overview of input output hardware used in VR system. Understand the system of human vision and its implication on perception and rendering. To explore the concepts of Virtual reality and develop 3D virtual environment. It will help students build various types of VR experiences and use Unity to develop VR applications. 						

Course Outcomes	
CO1	Describe how VR systems work and list the applications of VR.
CO2	Understand the design and implementation of the hardware that enables VR systems to be built
CO3	Understand the concepts of content creation, interaction and iterative design.
CO4	Create 3D scenes with Unity and experiment with various user interface (UI) techniques that are used in VR applications.
CO5	Describe the importance of interaction and audio in VR systems.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Virtual Reality	Fundamental concept and components of Virtual Reality, Primary features and Present development in Virtual Reality, Modern experiences, Historical Perspective, Needs of VR, Bird's-Eye View, Hardware, Sensors, Displays, Software, Virtual World Generator, Game Engines, Human Senses, Perceptual Psychology, Psychophysics. Examples of VR Systems.	8	CO1
2	Multiple Models of Input and Output Interface in Virtual Reality Input	Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus and 3DScanner etc. Output: Visual /Auditory / Haptic Devices.	8	CO2
3	Visual Computation in Virtual Reality	Fundamentals of Computer Graphics, Software and Hardware technology on Stereoscopic Display. Advanced Techniques in Computer Graphics: Management of Large-Scale Environments and Real Time Rendering.	8	CO3
4	Interactive Techniques in Virtual Reality	Body Track, Hand Gesture, 3D Manus, Object Grasp. Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR, X3D Standard, Vega, MultiGen, Virtools etc.	8	CO4
5	Application of Virtual Reality in Digital Entertainment	Virtual Reality Technology in Film and TV Production, Virtual Reality Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by Virtual Reality.	8	CO5

Reference Books:	
1.	Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2.	Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
e-Learning Source:	
1.	https://nptel.ac.in/courses/106106138
2.	https://archive.nptel.ac.in/courses/121/106/121106013/

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	PSO4	PSO5	PSO6	PSO7
CO1	3	1			1	1							2	1				
CO2	1		3	1	2	1	1						2	1				
CO3	2	1		2		1	1				1		2	1				
CO4		1	3		1	1							1	1				
CO5	2	1		1		1	1						2	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA566	Title of the Course	MOBILE COMPUTING	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> Students to understand the concept of mobile computing paradigm, its functions and its new boundaries. Understanding the typical infrastructure for mobile networks through a popular GSM architecture. Understanding problems and solutions for different layers of mobile networks, namely MAC layers, network layers and transport layers. Understanding of the data delivery models and database issues in mobile environments. To understand the Mobile Ad-hoc Networks (MANETs) and Routing protocols. Understanding of the Platform/Operating Systems for Application Development and Android Application Development. 						

Course Outcomes	
CO1	Understand and think to develop the new mobile computing-based application.
CO2	Capable to discuss on some new methodological dispute associated to this new paradigm and can conclude with some good facts.
CO3	Understand the database issues in mobile environments and data delivery models in mobile computing.
CO4	Clever to improve mobile ad-hoc network (MANET) applications and/or procedures/protocols.
CO5	Able to develop and describe various existing or new mobile environment related protocols.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Mobile Communications and Computing	Introduction, Applications, Limitations and Architecture. Cellular Overview: Cellular Networks, Cellular Concept, Channel Allocation, Location Management, Handoff. GSM: Air-interface, Mobile Services. System Architecture: Radio Subsystem, Network and Switching Subsystem, Operation Subsystem. Protocols: Localization and Calling, Handover.	8	CO1
2	Wireless LANs and Application	WLAN, Wireless Standards, Wireless LAN, Infrared Vs Radio Transmission, Infrastructure Networks, Adhoc Networks, Wireless Applications, Mac Issues, Mobile IP. Wireless Application Protocol: Architecture, Protocol Stack, Application Environment, IEEE Applications. Access Technologies: Bluetooth, GPRS, 802.11, CDMA. Mobile Phone Technologies: 1G, 2G, 2.5G, 3G.	8	CO2
3	Database Issues	Hoarding Techniques, Caching Invalidation Mechanisms, Client Server Computing with Adaptation, Power-aware and Context-aware Computing, Transactional Models, Query Processing, Recovery, Quality of Service Issues.	8	CO3
4	Mobile Ad-Hoc Networks (MANET)	Characteristics, Performance Issues, TCP Issues, Disconnected Operations, Data Broadcasting and Mobile Agents, Routing in Mobile Hosts. Routing Protocols: Global State Routing (GSR), Destination Sequenced Distance Vector Routing (DSDV), Dynamic Source Routing (DSR), Ad Hoc on Demand Distance Vector Routing (AODV), Temporary Ordered Routing Algorithm (TORA), QoS in Ad Hoc Networks, Applications.	8	CO4
5	Platform/Operating Systems for Application Development	Introduction to Palm OS, Windows CE, Embedded Linux, J2ME, Symbian. Android Application Development: Overview of Android, Devices Running Android, Development Tools for Android, Features of Android, Architecture of Android, Libraries, Software Development Kit.	8	CO5

Reference Books:	
1.	J. Schiller, "Mobile Communications", Addison Wesley Publication.
2.	A.Mehrotra, "GSM System Engineering", Addison Wesley Publication.
3.	M. Heijden, M. Taylor, "Understanding WAP", Artech House Publication.
4.	Reto Meier, "Professional Android Application Development", Wrox Publications.
e-Learning Source:	
1.	https://archive.nptel.ac.in/courses/121/106/121106013
2.	https://nptel.ac.in/courses/106106147

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	PSO4	PSO5	PSO6	PSO7
	CO1	2	2	3	1	2	1	1	1	1	1	3		2	1			
CO2	3			3	3				2	1			1	2				
CO3	1	3	2	3		1		1					2	1				
CO4	2	1	2		3	3	3		1		2		1					
CO5	2	1	3	1			3		2		3		2	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA567	Title of the Course	MACHINE LEARNING WITH PYTHON PROGRAMMING LAB	L	T	P	C
Year	II	Semester	III	0	0	3	1
Pre-Requisite	None	Co-requisite	CA552				
Course Objectives	<ul style="list-style-type: none"> To learn and understand different Data sets in implementing the machine learning algorithms. Implement the machine learning concepts and algorithms using python programming. Implement various type of classification methods including SVM, Naive bayes, decision tree, and random forest. Interpret unsupervised learning and learn to use clustering algorithms. 4. Implement linear and polynomial regression, understand ridge and lasso regression. 						

Course Outcomes	
CO1	Implement procedures for the machine learning algorithms.
CO2	Design Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms.
CO4	Identify and apply Machine Learning algorithms to solve real world problems.
CO5	Design and develop Python programs to implement linear and polynomial regression.

Experiment No.	Title of the Experiment	Content of Unit	Contact Hrs.	Mapped CO
1	Python Programming-I	1. Write a program to demonstrate different sequence datatypes provided in python. 2. Write a program to create, concatenate and print a string and accessing substring from a given string.	6	CO1
2	Python Programming-II	1. Write a python program to define a module and import a specific function in that module to another program. 2. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.	6	CO2
3	Machine Learning algorithms	1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. 2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	6	CO3
4	Machine Learning algorithms to solve real world problems	1. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. 2. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Python library classes can be used to write the program. Calculate the accuracy, precision and recall for your data set.	9	CO4
5	Linear and polynomial regression	1. Write a program to implement k -Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem. 2. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.	9	CO5

Reference Books:
1. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'Reilly Media, 1st edition, 2016.
2. M. Gopal, "Applied Machine Learning", McGraw Hill Education, 2019.
3. Allen Downey, "Think Python", Green Tea Press, 2015.
4. W. Chun, "Core Python Programming", Pearson, 2006.
e-Learning Source:
1. https://ml-course.github.io/master/labs/Lab%201%20-%20Tutorial
2. https://archive.nptel.ac.in/courses/106/106/106106147/

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	PSO4	PSO5	PSO6	PSO7
CO1		2	3	1		1	1						2	2				
CO2	1	1	3	2		1		1					1	1				
CO3	1	2	1	3		1	1						1	2				
CO4	2	1		3	1		1	1					2	1				
CO5		1	3	2	2	1	1						2	1				

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



Integral University, Lucknow

Effective from Session: 2021-22							
Course Code	CA568	Title of the Course	WEB TECHNOLOGY LAB	L	T	P	C
Year	II	Semester	III	0	0	3	1
Pre-Requisite	NONE	Co-requisite	CA553				
Course Objectives	<ul style="list-style-type: none"> Learn to design static web pages by using HTML elements. Learn to apply CSS concepts for designing HTML web pages. Learn to add JavaScript in web pages. Learn to develop basic programs based on PHP and AJAX. Learn to develop a web portal using HTML, CSS& JavaScript. 						

Course Outcomes	
CO1	Able to design web pages by using HTML tags.
CO2	Able to apply CSS concepts for developing dynamic web pages
CO3	Able to understand how to add validations using JavaScript in web pages.
CO4	Able to implement basic programs based on PHP and AJAX.
CO5	Able to design web applications using HTML

Exper iment No.	Title of the Experiment	Content of Unit	Contact Hrs.	Mapped CO
1	Experiment-1	Design a web page to display your CV	3	CO1
2	Experiment-2	Design a HTML page using links, list, and table tag etc..	3	CO1
3	Experiment-3	Design a HTML form for railway reservation.	3	CO2
4	Experiment-4	Design a HTML form for user registration.		CO3
5	Experiment-5	In the form mentioned in problem 3 to reserve a railway ticket add the following validations using JavaScript. From City A to City B and Age of passengers should not be greater than 100. Name of the passenger should be a string of a maximum length 20.	3	CO3
6	Experiment-6	In the form mentioned in problem 4 add validation using JavaScript.	3	CO3
7	Experiment-7	Write a JavaScript to prompt for username and display a welcome message and username.	3	CO4
8	Experiment-8	Write a program for illustrating client/server side scripting with help of ASP.	3	CO4
9	Experiment-9	Write a code in XML for creating DTD, which specifies set of rules.	3	CO4
10	Experiment-10	Create style sheets in CSS/XSL and display the document in Browser.	3	CO3
11	Experiment-11	Basic programs based on PHP		CO5
12	Experiment-12	Basic programs based on AJAX.	3	CO5
13	Experiment-13	Mini Project: Develop a web portal.	3	CO5

Reference Books:	
1.	Burdman, "Collaborative Web Development", Addison Wesley.
2.	Sharma & Sharma, "Development of E-Commerce Sites," Addison Wesley.
3.	Ivan Bayross, "Web Technologies Part II", BPB Publications.
4.	Steven Holzer, "HTML Black Book", Dreamtech Press.
e-Learning Source:	
1.	http://nptel.ac.in/courses/106105084/11
2.	https://sites.google.com/a/venusict.org/web-application-development/goog_1295399977

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	PSO4	PSO5	PSO6	PSO7
	CO1	1		3	1	2	1	1						2				
CO2	1	2	2	3		1		1					2	1				
CO3	2	1		2		1		1					1					
CO4		1	3	2	1	1	1						2	1				
CO5		1	3	1	2		1	1					1	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CA569	Title of the Course	COMPUTER GRAPHICS LAB	L	T	P	C
Year	II	Semester	III	0	0	2	1
Pre-Requisite	NONE	Co-requisite	CA554				
Course Objectives	<ul style="list-style-type: none"> 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 projection, 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 and projection 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.

Exper iment 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	Transformation	Write a Program to implement 3D algorithm for parallel and perspective projection.	2	CO3
5	Curve	Write a Program to represent curve and surfaces.	2	CO3
6	Animation	Moving (animate) any 2D, 3D object along with the axis.	2	CO4
7	Animation	Application on Audio-Video mixes and clip making.	2	CO4
8	Graphics Packages	An outline of designing software like Photoshop and CorelDraw.	2	CO4
9	Graphics Packages	Introduction to Flash 5.0 creating a small animation using Flash 5.0.	2	CO5
10	Graphics Packages	Apply animation on text using 3D Cool.	2	CO5
11	Graphics Packages	Introduction to creating an animation using 3D studio Max R Animator pro/Video Studio/Scala 2000.	2	CO5

Reference Books:	
1.	Donald Hearn and M Pauline Baker, "Computer Graphics", PHI.
2.	Kelly L. Murdock, "3ds Max-Bible 2011", Wiley Publications.
3.	Steven Harrington, "Computer Graphics: A Programming Approach", TMH.
4.	Prajapati A.K., "Computer Graphics", Pragati Prakashan Ed2.
e-Learning Source:	
1.	https://nptel.ac.in/courses/106106090
2.	https://onlinecourses.nptel.ac.in/noc20_cs90/

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	PSO4	PSO5	PSO6	PSO7
	CO1	1	1	3	2		1		1					2	1			
CO2		1	2	3		2	1						1	1				
CO3		1	3	2	1	1		1					1	1				
CO4	1		2	2		1		1					2	1				
CO5	1		2	2	2	1	1	1					2	1				

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



Integral University, Lucknow

Effective from Session: 2021-2022							
Course Code	CAN01	Title of the Course	CYBER SECURITY	L	T	P	C
Year	II	Semester	III	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives	<ul style="list-style-type: none"> To provide Knowledge and concept of information system with its type and e-commerce. To make familiar with security, threat, web security of information system. To know about the security threat related to e-commerce. To give the basic learning about the payment system of e-commerce. To provide an understanding the security issues on internet with respect to transaction, client-server, network To develop an understanding the different types of cyber fraud, cybercrime and cyber law. 						

Course Outcomes	
CO1	Know about the concept of information system with its type and e-commerce.
CO2	Get familiar with security, threat, web security of information system.
CO3	Know about the security threat related to e-commerce.
CO4	Learn the payment system of e-commerce.
CO5	Understand the security issues on internet with respect to transaction, client-server, network and biometric.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Information Systems, Fundamentals of E-Commerce	Types of Information Systems, Development of Information Systems, Introduction to Information Security, Need for Information Security, Threats to Information Systems, Information Assurance, Cyber Security and Security Risk Analysis. Basic of E-Commerce, Types of E-Commerce, Benefits, Advantages and Disadvantages, Impact of E-Commerce on Business.	8	CO1
2	Application Security	Data Security Considerations, Backups, Archival Storage and Disposal of Data. Security Threats: Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce, Electronic Payment System, E-Cash, Credit/Debit Cards, Digital Signature.	8	CO2
3	Internet Security	Security Issues on Web, Importance of Firewall, Components of Firewall, Transaction Security, Emerging Client Server, Security Threats, Network Security, Factors to Consider in Firewall Design, Limitation of Firewalls, Introduction to Biometric Security and its Challenges, Finger Prints.	8	CO3
4	Fundamentals of Cyber Law	Security Policies, WWW Policies, E-mail Security Policies, Corporate Policies, Publishing and Notification Requirement of the Policies. Intellectual Property Law: Copyright Act, Patent Law, Software License, Semiconductor Law and Patent Law, Cyber Laws in India: ITAct 2000 Provisions.	8	CO4
5	Investigation and Ethics	Cyber Crime, Cyber Jurisdiction, Cyber Crime and Evidence Act, Treatment of Different Countries of Cyber Crime, Ethical Issues in Data and Software Privacy, Plagiarism, Pornography, Tampering Computer Documents, Data Privacy and Protection, Domain Name System, Software Piracy, Issues in Ethical Hacking.	8	CO5

Reference Books:	
1.	Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
2.	Bajaj and Nag, "E-Commerce: The Cutting Edge of Business", TMH.
3.	Harish Chander, "Cyber Law and IT Protection", PHI Publication.
4.	Merkov, Breithaupt, "Information Security", Pearson Education.
e-Learning Source:	
1.	https://onlinecourses.swayam2.ac.in/ugc19_hs25/
2.	https://nptel.ac.in/courses/106105031

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	PSO4	PSO5	PSO6	PSO7
	CO1	2	1			1	1	1						2	1			
CO2	2	1		2	1		1						1	2				
CO3	2			1		1	1						1	1				
CO4	1	1		2		2	1						2					
CO5	2	1		1	1	2							1	1				

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