

**DEPARTMENT OF
ARTIFICIAL
INTELLIGENCE AND DATA
SCIENCE**

2021 REGULATION

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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	Utilize their proficiencies in the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, data science and statistics to build systems that require management and analysis of large volumes of data.
PEO 2	Advance their technical skills to pursue pioneering research in the field of AI and Data Science and create disruptive and sustainable solutions for the welfare of ecosystems.
PEO 3	Think logically, pursue lifelong learning and collaborate with an ethical attitude in a multidisciplinary team.
PEO 4	Design and model AI based solutions to critical problem domains in the real world.
PEO 5	Exhibit innovative thoughts and creative ideas for effective contribution towards economy building.

PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigation soft complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO8	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO9	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO10	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO11	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1	Evolve AI based efficient domain specific processes for effective decision making in several domains such as business and governance domains.
PSO2	Arrive at actionable Foresight, Insight, hindsight from data for solving business and engineering problems
PSO3	Create, select and apply the theoretical knowledge of AI and Data Analytics along with practical industrial tools and techniques to manage and solve wicked societal problems
PSO4	Develop data analytics and data visualization skills, skills pertaining to knowledge acquisition, knowledge representation and knowledge engineering, and hence be capable of coordinating complex projects.
PSO5	Able to carry out fundamental research to cater the critical needs of the society through cutting edge technologies of AI.

LIST OF COURSES**REGULATION 2021**

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE		
SEMESTER I		
S. NO.	COURSE CODE	COURSE TITLE
1	IP3151	Induction Programme
THEORY		
2	HS3152	Professional English - I
3	MA3151	Matrices and Calculus
4	PH3151	Engineering Physics
5	CY3151	Engineering Chemistry
6	GE3151	Problem Solving and Python Programming
7	GE3152	Heritage of Tamils
PRACTICALS		
8	GE3171	Problem Solving and Python Programming Laboratory
9	BS3171	Physics and Chemistry Laboratory
10	GE3172	English Laboratory
SEMESTER II		
S. NO.	COURSE CODE	COURSE TITLE
THEORY		
1	HS3252	Professional English - II
2	MA3251	Statistics and Numerical Methods
3	PH3256	Physics for Information Science
4	BE3251	Basic Electrical and Electronics Engineering
5	GE3251	Engineering Graphics
6	AD3251	Data Structures Design
7	GE3252	Tamils and Technology
8		NCC Credit Course Level 1 [#]
PRACTICALS		
9	GE3271	Engineering Practices Laboratory
10	AD3271	Data Structures Design Laboratory
11	GE3272	Communication Laboratory / Foreign Language
SEMESTER III		
S. NO.	COURSE CODE	COURSE TITLE
THEORY		
1	MA3354	Discrete Mathematics
2	CS3351	Digital Principles and Computer Organization
3	AD3391	Database Design and Management
4	AD3351	Design and Analysis of Algorithms
5	AD3301	Data Exploration and Visualization
6	AL3391	Artificial Intelligence
PRACTICALS		

7	AD3381	Database Design and Management Laboratory
8	AD3311	Artificial Intelligence Laboratory
9	GE3361	Professional Development
SEMESTER IV		
S. NO.	COURSE CODE	COURSE TITLE
THEORY		
1	MA3391	Probability and Statistics
2	AL3452	Operating Systems
3	AL3451	Machine Learning
4	AD3491	Fundamentals of Data Science and Analytics
5	CS3591	Computer Networks
6	GE3451	Environmental Sciences and Sustainability
7		NCC Credit Course Level 2 [#]
PRACTICALS		
8	AD3411	Data Science and Analytics Laboratory
9	AD3461	Machine Learning Laboratory
SEMESTER V		
S. NO.	COURSE CODE	COURSE TITLE
THEORY		
1	AD3501	Deep Learning
2	CW3551	Data and Information Security
3	CS3551	Distributed Computing
4	CS3554	Big Data Analytics
5	CCS335	Cloud Computing
6	CCS366	Software Testing and Automation
7	MX3084	Disaster Risk Reduction and Management
PRACTICALS		
8	AD3551	Deep Learning Laboratory
9	AD3512	Summer Internship
SEMESTER VI		
S. NO.	COURSE CODE	COURSE TITLE
THEORY		
1	CS3691	Embedded Systems and IoT
2		Open Elective - I
3		Professional Elective III
4		Professional Elective IV
5		Professional Elective V
6		Professional Elective VI
SEMESTER VII		
S. NO.	COURSE CODE	COURSE TITLE
THEORY		
1	GE3791	Human Values and Ethics

2		Elective – Management
3		Open Elective - I
4		Open Elective - I
SEMESTER VIII		
S. NO.	COURSE CODE	COURSE TITLE
PRACTICALS		
1	AD3811	Project Work/Internship

COURSE OUTCOME FOR ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

DEGREE	U.G
PROGRAMME	B.Tech – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
ACADEMIC YEAR	2022-23
REGULATION	2021

SEMESTER 01

1.Course Code and Name : HS3151 PROFESSIONAL ENGLISH - I

	CO Statements	Knowledge Level
At the end of the course, learners will be able		
1	To use appropriate words in a professional context	K2
2	To gain understanding of basic grammatic structures and use them in right context.	K2
3	To read and infer the denotative and connotative meanings of technical texts	K2
4	To write definitions, descriptions, narrations and essays on various topics	K3

2.Course Code and Name : MA3151 MATRICES AND CALCULUS

	CO Statements	Knowledge Level
At the end of the course the students will be able to		
1	Use the matrix algebra methods for solving practical problems.	K3
2	Apply differential calculus tools in solving various application problems.	K3
3	Able to use differential calculus ideas on several variable functions.	K3
4	Apply different methods of integration in solving practical problems.	K3
5	Apply multiple integral ideas in solving areas, volumes and other practical problems.	K3

3.Course Code and Name : PH3151 ENGINEERING PHYSICS

	CO Statements	Knowledge Level
After completion of this course, the students should be able to		
1	Understand the importance of mechanics.	K1
2	Express their knowledge in electromagnetic waves.	K2
3	Demonstrate a strong foundational knowledge in oscillations, optics and lasers.	K3
4	Understand the importance of quantum physics.	K3
5	Comprehend and apply quantum mechanical principles towards the formation of energy bands	K4

4.Course Code and Name : CY3151 ENGINEERING CHEMISTRY

	CO Statements	Knowledge Level
At the end of the course, the students will be able:		
1	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.	K3
2	To identify and apply basic concepts of nano science and nanotechnology in designing the synthesis of nano materials for engineering and technology applications.	K4
3	To apply the knowledge of phase rule and composites for material selection Requirements.	K2
4	To recommend suitable fuels for engineering processes and applications.	K2
5	To recognize different forms of energy resources and apply them for suitable applications in energy sectors.	K3

5.Course Code and Name : GE3151 PROBLEM SOLVING AND PYTHON PROGRAMMING

	CO Statements	Knowledge Level
Upon completion of the course, students will be able to		
1	Develop algorithmic solutions to simple computational problems.	K3
2	Develop and execute simple Python programs.	K3
3	Write simple Python programs using conditionals and loops for solving problems.	K4
4	Decompose a Python program into functions.	K4
5	Represent compound data using Python lists, tuples, dictionaries etc.	K4
6	Read and write data from/to files in Python programs.	K4

6.Course Code and Name : GE3171 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

	CO Statements	Knowledge Level
On completion of the course, students will be able to		
1	Develop algorithmic solutions to simple computational problems	K3
2	Develop and execute simple Python programs.	K4
3	Implement programs in Python using conditionals and loops for solving problems.	K2
4	Deploy functions to decompose a Python program.	K3
5	Process compound data using Python data structures.	K4
6	Utilize Python packages in developing software applications.	K2

7.Course Code and Name : BS3171 PHYSICS AND CHEMISTRY LABORATORY

	CO Statements	Knowledge Level
Upon completion of the course, the students will be able to		
PHYSICS LABORATORY :		
1	Understand the functioning of various physics laboratory equipment.	K3
2	Use graphical models to analyze laboratory data.	K2
3	Use mathematical models as a medium for quantitative reasoning and describing physical reality.	K1
4	Access, process and analyze scientific information.	K1
5	Solve problems individually and collaboratively.	K1
CHEMISTRY LABORATORY:		
1	To analyse the quality of water samples with respect to their acidity, alkalinity, Hardness and DO.	K2
2	To determine the amount of metal ions through volumetric and spectroscopic techniques	K1
3	To analyse and determine the composition of alloys.	K1
4	To learn simple method of synthesis of nanoparticles	K2
5	To quantitatively analyse the impurities in solution by electro analytical techniques	K3

8.Course Code and Name : GE3172 ENGLISH LABORATORY

	CO Statements	Knowledge Level
Upon completion of the course, the students will be able to		
1	To listen to and comprehend general as well as complex academic information	K2
2	To listen to and understand different points of view in a discussion	K2
3	To speak fluently and accurately in formal and informal communicative contexts	K2
4	To describe products and processes and explain their uses and purposes clearly and	K2

	accurately	
5	To express their opinions effectively in both formal and informal discussions	K2

SEMESTER 02

1.Course Code and Name : HS3251 PROFESSIONAL ENGLISH - II

	CO Statements	Knowledge Level
At the end of the course learners will be able to		
1	To compare and contrast products and ideas in technical texts.	K2
2	To identify and report cause and effects in events, industrial processes Through technical texts.	K2
3	To analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.	K2
4	To present their ideas and opinions in a planned and logical manner	K3
5	To draft effective resumes in the context of job search.	K4

2.Course Code and Name : MA3251 STATISTICS AND NUMERICAL METHODS

	CO Statements	Knowledge Level
Upon successful completion of the course, students will be able to		
1	Apply the concept of testing of hypothesis for small and large samples in real life Problems.	K3
2	Apply the basic concepts of classifications of design of experiments in the field of Agriculture.	K3
3	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	K3
4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	K3
5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	K3

3.Course Code and Name : PH3256 PHYSICS FOR INFORMATION SCIENCE

	CO Statements	Knowledge Level
At the end of the course, the students should be able to		
1	Gain knowledge on classical and quantum electron theories, and energy band structures	K2
2	Acquire knowledge on basics of semiconductor physics and its applications in various Devices.	K3
3	Get knowledge on magnetic properties of materials and their applications in data Storage.	K3
4	Have the necessary understanding on the functioning of optical materials for Opto electronics.	K2
5	Understand the basics of quantum structures and their applications in carbon and basics of quantum computing.	K2

4.Course Code and Name : BE3251 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

	CO Statements	Knowledge Level
At the end of the course, the students should be able to		

1	Compute the electric circuit parameters for simple problems	K3
2	Explain the working principle and applications of electrical machines	K2
3	Analyze the characteristics of analog electronic devices	K4
4	Explain the basic concepts of digital electronics	K2
5	Explain the operating principles of measuring instruments	K2

5.Course Code and Name : GE3251 ENGINEERING GRAPHICS

	CO Statements	Knowledge Level
At the end of the course, the students should be able to		
1	Use BIS conventions and specifications for engineering drawing.	K3
2	Construct the conic curves, involutes and cycloid.	K3
3	Solve practical problems involving projection of lines.	K3
4	Draw the orthographic, isometric and perspective projections of simple solids.	K5
5	Draw the development of simple solids.	K5

6.Course Code and Name : AD3251 DATA STRUCTURES DESIGN

	CO Statements	Knowledge Level
Upon completion of the course, the students will be able to		
1	Explain abstract data types	K3
2	Design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications	K6
3	Design, implement, and analyse efficient tree structures to meet requirements Such as searching, indexing, and sorting.	K6
4	Model problems as graph problems and implement efficient graph algorithms to solve them	K6

7.Course Code and Name : GE3271 ENGINEERING PRACTICES LABORATORY

	CO Statements	Knowledge Level
Upon completion of this course, the students will be able to		
1	Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household Wood work.	K5
2	Wire various electrical joints in common household electrical wire work.	K6
3	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal Work.	K2
4	Solder and test simple electronic circuits;	K6
5	Assemble and test simple electronic components on PCB.	K6

8.Course Code and Name : CS3271 DATA STRUCTURES AND DESIGN LABORATORY

	CO Statements	Knowledge Level
1	Implement ADTs as Python classes	K3
2	Design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications	K6
3	Design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting	K6
4	Model problems as graph problems and implement efficient graph algorithms to solve	K6

	them	
9.Course Code and Name : GE3272 COMMUNICATION LABORATORY		
	CO Statements	Knowledge Level
1	Speak effectively in group discussions held in a formal/semi formal contexts.	K6
2	Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions	K6
3	Write emails, letters and effective job applications.	K6
4	Write critical reports to convey data and information with clarity and precision	K6
5	Give appropriate instructions and recommendations for safe execution of tasks	K6
SEMESTER 03		
1.Course Code and Name : MA3354 DISCRETE MATHEMATICS		
	CO Statements	Knowledge Level
At the end of the course, students would		
1	Have knowledge of the concepts needed to test the logic of a program.	K1
2	Have an understanding in identifying structures on many levels.	K1
3	Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.	K2
4	Be aware of the counting principles.	K2
5	Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.	K2
2.Course Code and Name : CS3351 DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION		
	CO Statements	Knowledge Level
At the end of the course, students would		
1	Design various combinational digital circuits using logic gates	K5
2	Design sequential circuits and analyze the design procedures	K5
3	State the fundamentals of computer systems and analyze the execution of an instruction	K1
4	Analyze different types of control design and identify hazards	K4
5	Identify the characteristics of various memory systems and I/O communication	K1
3.Course Code and Name : AD3391 DATABASE DESIGN AND MANAGEMENT		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Understand the database development life cycle and apply conceptual modeling	K1
2	Apply SQL and programming in SQL to create, manipulate and query the database	K1
3	Apply the conceptual-to-relational mapping and normalization to design relational database	K1
4	Determine the serializability of any non-serial schedule using concurrency techniques	K3
5	Apply the data model and querying in Object-relational and No-SQL databases.	K3
4.Course Code and Name : AD3351 DESIGN AND ANALYSIS OF ALGORITHMS		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		

1	Analyze the efficiency of recursive and non-recursive algorithms mathematically	K1
2	Analyze the efficiency of brute force, divide and conquer, decrease and conquer, Transform and conquer algorithmic techniques	K3
3	Implement and analyze the problems using dynamic programming and greedy algorithmic techniques.	K3
4	Solve the problems using iterative improvement techniques for optimization.	K3
5	Compute the limitations of algorithmic power and solve the problems using backtracking and branch and bound techniques.	K4

5.Course Code and Name : AD3301 DATA EXPLORATION AND VISUALIZATION

	CO Statements	Knowledge Level
On completion of this course, the students will be able to		
1	Understand the fundamentals of exploratory data analysis.	K3
2	Implement the data visualization using Matplotlib.	K5
3	Perform univariate data exploration and analysis.	K3
4	Apply bivariate data exploration and analysis.	K5
5	Use Data exploration and visualization techniques for multivariate and time series data.	K5

6.Course Code and Name : AL3391 ARTIFICIAL INTELLIGENCE

	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Explain intelligent agent frameworks	K5
2	Apply problem solving techniques	K5
3	Apply game playing and CSP techniques	K5
4	Perform logical reasoning	K5
5	Perform probabilistic reasoning under uncertainty	K4

7.Course Code and Name : AD3381 DATABASE DESIGN AND MANAGEMENT LABORATORY

	CO Statements	Knowledge Level
On completion of this course, the students will be able to		
1	Understand the database development life cycle	K5
2	Design relational database using conceptual-to-relational mapping, Normalization	K5
3	Apply SQL for creation, manipulation and retrieval of data	K5
4	Develop a database applications for real-time problems	K5
5	Design and query object-relational databases.	K5

8.Course Code and Name : AD3311 ARTIFICIAL INTELLIGENCE LABORATORY

	CO Statements	Knowledge Level
On completion of this course, the students will be able to		
1	Design and implement search strategies	K3
2	Implement game playing and CSP techniques	K3
3	Develop logical reasoning systems	K3
4	Develop probabilistic reasoning systems	K3

9.Course Code and Name :GE3361 PROFESSIONAL DEVELOPMENT

	CO Statements	Knowledge Level
On completion of this course, the students will be able to		
1	Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements	K3
2	Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding	K3
3	Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.	K3
4	Perform document statistical report using MS Word, Excel and PPT.	K3
5	Present and interpret data document using MS Word, Excel and PPT	K4
SEMESTER 04		
1.Course Code and Name : MA3391 PROBABILITY AND STATISTICS		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.	K5
2	Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.	K5
3	Apply the concept of testing of hypothesis for small and large samples in real life problems.	K5
4	Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.	K5
5	Have the notion of sampling distributions and statistical techniques used in Engineering and management problems.	K5
2.Course Code and Name : AL3452 OPERATING SYSTEMS		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Analyze various scheduling algorithms and process synchronization.	K4
2	Explain deadlock, prevention and avoidance algorithms.	K2
3	Compare and contrast various memory management schemes.	K2
4	Explain the functionality of file systems I/O systems, and Virtualization	K2
5	Compare iOS and Android Operating Systems.	K2
3.Course Code and Name : AL3451 MACHINE LEARNING		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Explain the basic concepts of machine learning.	K3
2	Construct supervised learning models.	K3
3	Construct unsupervised learning algorithms.	K3
4	Evaluate and compare different models	K3
4.Course Code and Name : AD3491 FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS		
	CO Statements	Knowledge Level

At the end of this course, the students will be able to		
1	Explain the data analytics pipeline	K4
2	Describe and visualize data	K3
3	Perform statistical inferences from data	K3
4	Analyze the variance in the data	K3
5	Build models for predictive analytics	K3
5.Course Code and Name : CS3591 COMPUTER NETWORKS		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Explain the basic layers and its functions in computer networks.	K4
2	Understand the basics of how data flows from one node to another.	K2
3	Analyze routing algorithms.	K2
4	Describe protocols for various functions in the network.	K2
5	Analyze the working of various application layer protocols.	K2
6.Course Code and Name : GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.	K2
2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.	K2
3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	K2
4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K2
5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.	K2
7.Course Code and Name : AD3411 DATA SCIENCE AND ANALYTICS LABORATORY		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Write python programs to handle data using Numpy and Pandas	K2
2	Perform descriptive analytics	K2
3	Perform data exploration using Matplotlib	K2
4	Perform inferential data analytics	K2
5	Build models of predictive analytics	K2
8.Course Code and Name : AD3461 MACHINE LEARNING LABORATORY		
	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Apply suitable algorithms for selecting the appropriate features for analysis.	K5
2	Implement supervised machine learning algorithms on standard datasets and evaluate the performance.	K5

3	Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance.	K3
4	Build the graph based learning models for standard data sets.	K5
5	Assess and compare the performance of different ML algorithms and select the suitable one based on the application.	K5

SEMESTER 05

1.Course Code and Name : AD3501 DEEP LEARNING

	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Explain the basics in deep neural networks	K2
2	Apply Convolution Neural Network for image processing	K2
3	Apply Recurrent Neural Network and its variants for text analysis	K4
4	Apply model evaluation for various applications	K2
5	Apply auto encoders and generative models for suitable applications	K4

2.Course Code and Name : CW3551 DATA AND INFORMATION SECURITY

	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Understand the basics of data and information security	K2
2	Understand the legal, ethical and professional issues in information security	K2
3	Understand the various authentication schemes to simulate different applications.	K3
4	Understand various security practices and system security standard	K2
5	Understand the Web security protocols for E-Commerce applications	K5

3.Course Code and Name : CS3551 DISTRIBUTED COMPUTING

	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Explain the foundations of distributed systems	K2
2	Solve synchronization and state consistency problems	K5
3	Use resource sharing techniques in distributed systems	K3
4	Apply working model of consensus and reliability of distributed systems	K3
5	Explain the fundamentals of cloud computing	K2

4.Course Code and Name : CCS334 BIG DATA ANALYTICS

	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	Describe big data and use cases from selected business domains.	K2
2	Explain NoSQL big data management.	K1
3	Install, configure, and run Hadoop and HDFS.	K3
4	Perform map-reduce analytics using Hadoop.	K3
5	Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.	K3

5.Course Code and Name : CCS335 CLOUD COMPUTING

	CO Statements	Knowledge Level
At the end of this course, the students will be able to		

1	Understand the design challenges in the cloud.	K5
2	Apply the concept of virtualization and its types.	K5
3	Experiment with virtualization of hardware resources and Docker.	K5
4	Develop and deploy services on the cloud and set up a cloud environment.	K5
5	Explain security challenges in the cloud environment.	K5

6.Course Code and Name : CCS336 SOFTWARE TESTING AND AUTOMATION

	CO Statements	Knowledge Level
1	Understand the basic concepts of software testing and the need for software testing	K2
2	Design Test planning and different activities involved in test planning	K3
3	Design effective test cases that can uncover critical defects in the application	K3
4	Carry out advanced types of testing	K1
5	Automate the software testing using Selenium and TestNG	K1

7.Course Code and Name : MX3084 DISASTER RISK REDUCTION AND MANAGEMENT

	CO Statements	Knowledge Level
At the end of this course, the students will be able to		
1	To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)	K5
2	To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction	K3
3	To develop disaster response skills by adopting relevant tools and technology	K5
4	Enhance awareness of institutional processes for Disaster response in the country and	K3
5	Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity	K5

8. Course Code and Name : CCS356 DEEP LEARNING LABORATORY

	CO Statements	Knowledge Level
1	Apply deep neural network for simple problems	K3
2	Apply Convolution Neural Network for image processing	K3
3	Apply Recurrent Neural Network and its variants for text analysis	K3
4	Apply generative models for data augmentation	K3
5	Develop real-world solutions using suitable deep neural networks	K4