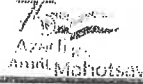




COLLEGE OF AGRICULTURAL INFORMATION TECHNOLOGY
ANAND AGRICULTURAL UNIVERSITY
ANAND – 388 110 • GUJARAT • BHARAT



Dr. D.R. Kathiriya
Principal & Dean



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Read: Resolution of 57th meeting of the Board of Management held on 16-01-2023, Anand Agricultural University, Anand vide Item No. 57.17 has resolved as under

Approval of Post Graduate Diploma in Data
Science under the Faculty of Agricultural
Information Technology

NOTIFICATION

It is hereby notified to all concerned that vide Item No. 57.17 of the 57th meeting held on 16-01-2023, the Board of Management of the Anand Agricultural University, has resolved as under.

“It is resolved to approve the offering of a new course, Post Graduate Diploma in Data Science under the Faculty of Agricultural Information Technology from the academic year 2023–24 along with the course syllabus and academic regulations as appended in Appendix-I and Appendix-II.”

No. AAU/AIT/ACAD/ 1079 - 85 /2023

Date: 27-01-2023

Dr. D.R. Kathiriya
PRINCIPAL & DEAN

Copy F.W.Cs. to:

1. All Members of Board of Management of this University.
2. All Officers of this University.
3. All Deans and Principals, AAU, Anand

Copy to:

1. P.S. to Vice-Chancellor, Anand Agricultural University, Anand.
2. P.A. to Registrar, Anand Agricultural University, Anand.
3. Office of Registrar (Examination), Legal and Academic Branch (20 Copies).
4. Academic File

Syllabus for
Post Graduate Diploma in Data Science

College of Agricultural Information Technology
Anand Agricultural University
Anand – 388110

SYLLABUS OF POST GRADUATE DIPLOMA IN DATA SCIENCE

Semester -I

Course No	Subject Name	TH	PR	CR	HRS
PGDDS 501	Database System	2	1	3	4
PGDDS 502	Statistics and Exploratory Data Analysis	2	1	3	4
PGDDS 503	Fundamentals of Machine Learning	2	1	3	4
PGDDS 504	Introduction to Python Programming	2	1	3	4
PGDDS 505	Block chain Technology	2	1	3	4
PGDDS 506	Deep Learning	2	1	3	4
	TOTAL CREDITS	12	6	18	24

Semester –II

PGDDS 507	Software Tools for Data Management	2	2	4	6
PGDDS 508	Cloud Computing	2	1	3	4
PGDDS 509	Big Data Analytics	2	1	3	4
PGDDS 510	Natural Language Processing	2	1	3	4
PGDDS 511	Business Analytics	2	1	3	4
PGDDS 599	Project	0	3	3	6
	TOTAL CREDITS	10	9	19	28

Semester -I

Course No	Subject Name	TH	PR	CR	HRS
PGDDS 501	Database System	2	1	3	4
PGDDS 502	Statistics and Exploratory Data Analysis	2	1	3	4
PGDDS 503	Fundamentals of Machine Learning	2	1	3	4
PGDDS 504	Introduction to Python Programming	2	1	3	4
PGDDS 505	Block chain Technology	2	1	3	4
PGDDS 506	Deep Learning	2	1	3	4
TOTAL CREDITS		12	6	18	24

PGDDS 501

Database System

3(2+1)

Objectives: To understand the different issues involved in the design and implementation of a database system. To learn the physical and logical database designs, database modeling, relational, hierarchical, and network models. To use data manipulation language to query, update, and manage a database. To understand essential DBMS concepts such as: database security, integrity, concurrency, storage strategies etc. The students will get the hands on practice of using SQL and PL/SQL concepts.

Unit I: Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), and Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit II: Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design

Unit III: Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, and Query optimization algorithms. Storage strategies: Indices, B-trees, hashing.

Unit IV: Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery, Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection

Unit V: SQL Concepts : Basics of SQL, DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, aggregate functions, Built-in

functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, join, Exist, Any, All , view and its types., transaction control commands.

Unit VI: PL/SQL Concepts: Cursors, Stored Procedures, Stored Function, Database Triggers.

Reference Books

1. Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. Fundamentals of Database Systems, 7th Edition by R. Elmasri and S. Navathe, Pearson
3. An introduction to Database Systems, C J Date, Pearson.
4. Modern Database Management, Hoffer , Ramesh, Topi, Pearson.
5. Principles of Database and Knowledge – Base Systems”, Vol 1 by J. D. Ullman, Computer Science Press.

PGDDS 502

Statistics and Exploratory Data Analysis

3(2+1)

Objectives: To impart basic managerial skills for collection & analysis of statistical data. To learn about graphical and modelling techniques for exploring data, with an emphasis on visualization, interpretation, and clear communication of findings.

Unit I: Introduction to Statistical Methods: Statistics & Managerial Decisions, Statistical Data, Operation Research Techniques.

Unit II: Data Collection And Analysis: Collection and presentation of data in terms of tables, graphs, raw data, frequency distributions, histogram etc. Cumulative frequency curve, Measures of central tendency and location, Partition values, Comparison of various measures of central tendencies, Measures of dispersion, skewness & kurtosis, comparison of various measures of dispersion.

Unit III: Probability Distribution & Statistics: Introduction of Probability, sample, space & events, Basic rules of probability, permutation & combinations, conditional probability, Bayes' theorem, distributions: Binomial, Poisson, Exponential and Normal distribution with their properties and application. Random variables –discrete and continuous probability distribution functions

Unit IV: Correlation And Regression Analysis: Curve fitting, correlation and regression analysis, Autocorrelation, Multiple regression, statistical Inference & estimation applied to Industrial problems.

Unit V: Understanding Data for Exploratory Analysis: Exploratory data analysis and data visualization, Perception, Continuous variables, Discrete variables, Dependency relationships, Multivariate categorical variables, Temporal data, Spatial data Data Science Pipeline: Collect, Import, Clean, Transform, Visualize, Model, and Communicate.

w.e.f. 2023-24

Unit VI: Statistical Tests and Testing of Hypothesis: Elementary theory and practice of sampling, standard error of means and variance, tests of significance, T test, F test, Z test and chi-square test along with their applications, Goodness of fit, testing of hypotheses and decision making, analysis of variance (ANOVA).

Unit VII: Elementary Mathematics: Solution of simultaneous linear equations & quadratic equations, Combinatorial mathematics (Simple rules of counting), Vectors, Matrices & Determinants, Solution of linear programming problems with two variables using graphs, Solution of linear and integer programming problems using EXCEL SOLVER, Functions, Limit & Continuity, Differentiation and Integration, Definite integrals.

Reference Books

1. Quantitative Techniques for Managerial Decision by U. K. Srivastava, G. V. Shenoy and S. C. Sharma New Age International Publishers.
2. Probability & Statistics for Engineers by Rao SCITECH
3. Statistics for Management by Lewis Pearson
4. Graphical Data Analysis with R by Unwin, Antony CRC Press, 2015 ISBN 978-1498715232
5. Interactive Data Visualization for the Web by Scott Murray O'REILLY, Second edition, ISBN-13: 978-1491921289

PGDDS 503

Fundamentals of Machine Learning

3(2+1)

Objectives: To learn basic concepts of supervised machine learning methods. To learn mathematical concepts, and algorithms used in machine learning.

Unit I: Introduction: Learning Problems, designing a learning system, Issues with machine learning. Concept Learning, Version Spaces and Candidate Eliminations, Inductive bias, Supervised, Unsupervised and Semi supervised Learning

Unit II: Supervised Learning: Decision Tree Representation, Appropriate problems for Decision tree learning, Algorithm, Hypothesis space search in Decision tree learning, inductive bias in Decision tree learning, Issues in Decision tree learning, Overfitting, Underfitting, Pre-pruning, Post-pruning

Unit III: Artificial Neural Networks: Neural Network Representation, Appropriate problems for Neural Network Learning, perceptron, Cost function, Gradient descent, Hypothesis formation, Multilayer Networks and Back Propagation Algorithms, Remarks on Back Propagation Algorithms Case Study: face Recognition

Unit IV: Bayesian Learning: Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least squared Error Hypothesis, Maximum likelihood hypothesis for Predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm Case Study: Learning to classify text

Unit V: Overview of typical application areas such as Recommender System etc

Reference Books

1. Machine Learning by Tom M Mitchell McGraw Hill, ISBN: 0070428077
2. Machine Learning in Action by Peter Harrington Manning Publications Co., ISBN 9781617290183
3. The Elements of Statistical Learning: Data Mining, Inference, and Prediction by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman Springer Series in Statistics, Second edition, ISBN 978-0-387-84858-7
4. Real-World Machine Learning by Henrik Brink, Joseph Richards, Mark Fetherolf Manning Publications Co., ISBN-10: 9781617291920, ISBN-13: 978-1617291920

PGDDS 504

Introduction to Python Programming

3(2+1)

Objectives: To write compact codes specifically for programming in data analytics, AI and scientific computing. To understand and use various constructs available in python language. To understand and apply various functions on file data.

Unit I: Introduction To Python: Installation and Working with Python, Understanding Python variables, Python basic Operators, Understanding python blocks

Unit II: Python Data Types: Declaring and using Numeric data types: int, float, complex, Using string data type and string operations, Defining list and list slicing, Use of Tuple data type

Unit III: Python Program Flow Control: Conditional blocks using if, else and elif, Simple for loops in python, For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block

Unit IV: Python Functions, Modules And Packages: Organizing python codes using functions, Organizing python projects into modules, Importing own module as well as external modules, Understanding Packages, Powerful Lamda function in python, Programming using functions, modules and external packages

Unit V: Python String, List And Dictionary Manipulations: Building blocks of python programs, Understanding string in build methods, List manipulation using in build methods, Dictionary manipulation, Programming using string, list and dictionary in build functions

Unit VI: Python File Operation: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Unit VII: Python Exception Handling: Avoiding code break using exception handling, Safe guarding file operation using exception handling, Handling and helping developer with error code, Programming using Exception handling

Reference Books

1. Core Python Programming by Dr. R. Nageswara Rao DreamTech, Second edition
2. Core Python Programming by Wesley J. Chun Prentice Hall PTR, Second Edition, ISBN-13: 978-0132269933, ISBN-10: 0132269937
3. Data Structures and Algorithms in Python by Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser Wiley
4. Fundamentals of Python – First Programs by Kenneth A. Lambert CENGAGE Publication, ISBN-13: 978-1111822705, ISBN-10: 1111822700

PGDDS 505

Blockchain Technology

3(2+1)

Objectives: To make the students aware about creation of strong cryptographic distributed and replicated ledger of events, transactions, and data generated through various IT processes. To make the students familiar with crypto currencies.

Unit I: Introduction: Basic ideas behind blockchain, How it is changing the landscape of digitalization, Cryptographic basics for cryptocurrency, A short overview of hashing, Signature schemes, Encryption schemes and elliptic curve cryptography

Unit II: Models for Blockchain: The Consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on permission-less, nameless, peerto- peer network, Abstract Models for Blockchain, GARAY model, RLA Model, Proof of Work (PoW) as random oracle, formal treatment of consistency, liveness and fairness, Proof of Stake (PoS) based Chains, Hybrid models (PoW + PoS)

Unit III: Mechanics of Bitcoin: Bitcoin, Wallet, Blocks, Merkley Tree, Bitcoin transactions, Transaction verifiability, Anonymity, Forks, Double spending, Mathematical analysis of properties of Bitcoin, Bitcoin scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements, How to store and use Bitcoins, Simple local storage,

Hot and cold storage, Splitting and sharing keys, Online wallets and exchanges, Payment services, Transaction fees, Currency exchange markets

Unit IV: Alternative coin and Recent Trends: Ethereum, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Smart Contracts, some attacks on smart contracts, Zero Knowledge proofs and protocols in Blockchain, Succinct non interactive argument for Knowledge (SNARK), pairing on Elliptic curves, Zcash

Unit V: Case Studies: Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems and others

Reference Books

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder Princeton University Press, 2016
2. SoK: Research Perspectives and Challenges for Bitcoin and Cryptocurrency by Joseph Bonneau et al IEEE Symposium on Security and Privacy, 2015
3. The bitcoin backbone protocol - analysis and applications by J.A.Garay et al EUROCRYPT 2015 LNCS VOL 9057, (VOLII), pp 281-310
4. Analysis of Blockchain protocol in Asynchronous networks by R.Pass et al EUROCRYPT 2017, (eprint.iacr.org/2016/454), A significant progress and consolidation of several principles

PGDDS 506

Deep Learning

3(2+1)

Objectives: To get insights of image and video analysis task using deep learning. To get the students aware about building blocks used in deep learning based solutions.

Unit I: Introduction: What is Deep Learning?, Why Deep Learning?, What is a neural network?, Deep Learning Success Stories, McCulloch Pitts Neuron, Thresholding Logic, Perceptron, Perceptron Learning Algorithm

Unit II: Deep Feedforward Networks and Regularization in Deep Learning: Example: Learning XOR, Gradient-based learning, Hidden units, Backpropagation and other differentiation algorithms, Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning, Early Stopping, Parameter

Tying and Parameter Sharing, Bagging and Other Ensemble Methods, Adversarial Training

Unit III: Convolutional Networks: The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured

Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks

Unit IV: Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory

Unit V: Deep Learning Applications, Platforms and Software Libraries: Large-scale deep learning, Computer vision, Speech recognition, Natural language processing, H2O.ai, Dato GraphLab, Theano, Caffe

Reference Books

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron An MIT Press book
2. Neural Networks and Deep Learning by Michael Nielsen
<http://neuralnetworksanddeeplearning.com>
3. Pattern Classification by Richard O. Duda, Peter E. Hart, David G. Stork John Wiley & Sons Inc

Semester –II

PGDDS 507	Software Tools for Data Management	2	2	4	6
PGDDS 508	Cloud Computing	2	1	3	4
PGDDS 509	Big Data Analytics	2	1	3	4
PGDDS 510	Natural Language Processing	2	1	3	4
PGDDS 511	Business Analytics	2	1	3	4
PGDDS 599	Project	0	3	3	6
	TOTAL CREDITS	10	9	19	28

PGDDS 507 Software Tools for Data Management 4(2+2)

Objectives: To become familiar with software tools available for data management. To explore the software tools, frameworks for real world applications by designing the modules. To become familiar with the functionalities provided by the data analysis tools, framework. To make a comparison of data management tools based on their applicability and limitations.

Following are suggested tools/libraries.

- Python Libraries (StatsModels, Pandas, Scikit-learn, Keras, PyTorch, TensorFlow, Matplotlib, Seaborn, Altair, Plotly)
- Visualization using Tableau, PowerBI
- Hadoop, Pg, Hive, MomgoDB
- Apache Spark and Stor

In each of above framework/tool/library, minimum 3 applications are to be developed. The applications are developed in such a way as to cover maximum functionalities provided by particular framework/tool/library.

PGDDS 508 Cloud Computing 3(2+1)

Objectives: To provide understanding of principles and concept of Cloud Computing. To make the students aware about Service Model with reference to Cloud Computing. To appreciate the role of Virtualization Technologies. To provide understanding of cloud security issues and solutions.

Unit I: Introduction to Cloud Computing: Overview, Roots of Cloud Computing, Layers and Types of Cloud, Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Infrastructure Management, Infrastructure as a Service Providers, as a Service Providers, Challenges and Risks

Unit II: Cloud Architecture, Services and Applications: Exploring the Cloud Computing Stack, Connecting to the Infrastructure as a Service, Platform as a Service, SaaS Vs. PaaS, Application Frameworks, Software as a Service Cloud Deployment Public vs Private Cloud

Unit III: Abstraction and Virtualization: Introduction to Virtualization Technologies, Load Balancing Virtualization, Understanding Hyper visors, Understanding Imaging, Porting Applications, Virtual Machines Provisioning Manageability Virtual Machine Migration Services, Virtual Provisioning and Migration in Action

Unit IV: Cloud Infrastructure and Cloud Resource Management: Architectural Design of Compute and Storage Clouds, Layered Architecture Development, Design Challenges, Inter Cloud Management, Resource Provisioning and Platform, Cloud Management Products, Emerging Cloud Management Standards

Unit V: Cloud Security: Security Overview, Cloud Security Challenges and Risks, Software-Service Security, Cloud computing security architecture: Architectural Considerations, General Issues Securing the Cloud, Securing Security, Application Security, Virtual Machine Security, Identity Presence, Identity Management and Access Control, Identity Management and Access control Identity management, Access control, Security Storage Area Networks,

Unit VI: Cloud Based Case-Studies: Overview of Cloud services, Designing Solutions for the Cloud, Implement Integrate Solutions, Emerging Markets and the Cloud, Tools for Private Cloud: IaaS using Eucalyptus, PaaS on IaaS – AppScale

Reference Books

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej Goscinski. Wiley India Edition
2. Cloud Computing Bible by Barrie Sosinsky Wiley Publishing Inc., ISBN-13: 978-0470903568, ISBN-10: 0470903562
3. Mastering Cloud Computing by Rajkumar Buyya, C. Vecchiola & S. Thamarai Selvi McGRAW Hill Publication
4. Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Online by Miller Michael Pearson Education India
5. Cloud Computing – A practical Approach by Velte T., Velte A., Elsenpeter R. Tata McGraw Hill

Objectives: To provide knowledge about scalable, reliable and distributed storage environment for huge amount of data. To provide insights of data analysis in distributed environment. To optimize business decisions and create competitive advantage with Big Data analytics. To introduce programming tools PIG & HIVE in Hadoop ecosystem. To be able to reasonably assess the application of big data analytics technologies for different usage scenarios

Unit I: Introduction to Big Data: Introduction– distributed file system–Big Data and its importance, Four Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce

Unit II: Introduction to Hadoop and its Architecture: Big Data – Apache Hadoop & Hadoop Ecosystem, Moving Data in and Hadoop – Understanding inputs and outputs of MapReduce Serialization

Unit III: HDFS, HIVE AND HIVEQL, HBASE: HDFS-Overview, Installation and Shell, Java API; Hive Architecture Installation, Comparison with Traditional Database, HiveQL Querying Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries, concepts, Advanced Usage, Schema Design, Advance Indexing, Zookeeper , how it helps in monitoring a cluster, HBase uses Zookeeper how to Build Applications with Zookeeper

Unit IV: SPARK: Introduction to Data Analysis with Spark, Downloading Spark and Started, Programming with RDDs, Machine Learning with MLlib

Unit V: NoSQL: Types of NoSQL databases, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL

Unit VI: Database for the Modern Web: Introduction to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document-Oriented, principles of schema design, Constructing queries Databases, collections and Documents, MongoDB Query Language

Reference Books

1. Professional Hadoop Solutions by Boris lublinsky, Kevin t. Smith, Alexey Yakubovich Wiley, ISBN-13: 978-1118611937, ISBN-10: 1118611934, 2015
2. Understanding Big data by Chris Eaton and Paul C. Zikopoulos McGraw Hill, 2012
3. Big Data and Analytics by Seema Acharya, Subhashini Chhellaippan Willey, Second edition
4. MongoDB in Action by Kyle Banker, Piter Bakkum , Shaun Verch DreamTech, ISBN 9781935182870, Second edition

5. HADOOP: The definitive Guide by Tom White O'Reilly, 2012
6. Big Data Analytics with R and Hadoop by Vignesh Prajapati Packet Publishing, 2013

PGDDS 510

Natural Language Processing

3(2+1)

Objectives: To make the students aware about processing of unstructured data. To design the computer programs that considers and processes the textual data as human-like comprehension. To design the computer system that able to understand and draw inferences from textual data.

Unit I: Introduction: What is Natural Language Processing, Ambiguity and uncertainty in language. The Turing test, Models and Algorithms

Unit II: Regular Expressions, Automata and Finite-State Transducers: Basic Regular Expression Patterns, Disjunction, Grouping, and Precedence, Examples, Advanced Operators, Regular Expression Substitution, Using FSA to Recognize Sheeptalk, Formal Languages, Nondeterministic FSAs, Using an NFSA to accept strings, Recognition as Search, Relating Deterministic and Non-deterministic Automata, Regular Languages and FSAs, Survey of (Mostly) English Morphology, Inflectional Morphology, Derivational Morphology, The Lexicon and Morphotactics, Morphological Parsing with Finite-State Transducers, Orthographic Rules and Finite-State Transducers, Human Morphological Processing

Unit III: N-gram Language Models: Words, Corpora, Text Normalization, Minimum Edit Distance, N-Grams, Evaluating Language Models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing

Unit IV: Word Classes and Part-of-Speech Tagging: English Word Classes, Tagsets for English, Part of Speech Tagging, Rulebased Part-of-speech Tagging, Stochastic Part-of-speech Tagging, The Actual Algorithm for HMM tagging, Transformation-Based Tagging, How TBL rules are applied, How TBL Rules are Learned, Multiple tags and multiple words, Unknown words, Class-based N-grams

Unit V: Context-Free Grammars for English and Parsing: Constituency, Context-Free Rules and Trees, Sentence-Level Constructions, The Noun Phrase, The Verb Phrase and Subcategorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence & Normal Form, Finite State & Context-Free Grammars, Grammars & Human Processing, Parsing as Search, Top-Down and Bottom-Up Parsing with comparison, A Basic Topdown Parser, Adding Bottom-up Filtering, Problems with the Basic Topdown Parser, Left Recursion, Ambiguity

Unit VI: Semantics and Pragmatics: Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Idioms and Compositionality, Robust Semantic Analysis, WordNet: A Database of Lexical Relations, Reference Resolution, Text Coherence, Discourse Structure, Psycholinguistic Studies of Reference and Coherence,

Reference books

1. Speech and Language Processing by Daniel Jurafsky and James H. Martin Second edition, Prentice Hall
2. Natural Language Understanding by Allen James Second edition, Benjamin/Cumming
3. Statistical Language Learning by Charniack Eugene MIT Press
4. Foundations of Statistical Natural Language Processing by Manning Christopher and Heinrich Schutze MIT Press

PGDDS 511

Business Analytics

3(2+1)

Objectives: To develop domain knowledge of various technology and its application to facilitates managerial decision/MIS. To understand the significance of global platform for data retrieval/process among different business cultures of the world. To provide knowledge of forecasting techniques after analysis of business data.

Unit I: Overview of Business analytics: Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics Statistical Tools, Statistical Notation, Descriptive Statistical methods, Review of probability, distribution and data modeling, sampling and estimation methods overview

Unit II: Trendiness and Regression Analysis: Modeling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology

Unit III: Organization Structures of Business analytics: Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative modeling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive modeling, nonlinear Optimization

Unit IV: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for

Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model

Unit V: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making

Unit VI: Recent Trends: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism

Reference Books

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey Pearson FT Press
2. Business Analytics by James Evans Persons Education

PGDDS 599

Project

3(0+3)

This project will allow the student to implement the skills student learned throughout this program. Through dedicated mentoring sessions, the student will learn how to solve a real-world, industry-aligned Data Science problem, from data processing and model building to reporting your business results and insights. The project is the final step in the learning path and will enable the student to showcase her/his expertise in Data Science to future employers

The project milestones are as follows:

1. Data Processing: Student will apply various data processing techniques to make raw data meaningful.
2. Model Building: Student will leverage techniques such as regression and decision trees to build Machine Learning models that enable accurate and intelligent predictions. Student may explore Python to build model. Student will follow the complete model-building exercise from data splitting, to testing, training and validating data using the k-fold cross validation process.
3. Model Fine-tuning : Student will apply various techniques to improve the accuracy of model and select the champion model that provides the best accuracy.
4. Dashboarding and Representing Results : As the last step, student will be required to export results into a dashboard with meaningful insights using Tableau.

**ACADEMIC REGULATIONS
FOR
POST GRADUATE DIPLOMA IN DATA
SCIENCE IN THE
ANAND AGRICULTURAL
UNIVERSITY OF GUJARAT
(2023-24)**



**Anand Agricultural University
Anand-3881 10**

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ACADEMIC REGULATIONS (2023-24) FOR POST GRADUATE DIPLOMA IN DATA SCIENCE IN ANAND AGRICULTURAL UNIVERSITY OF GUJARAT	
In exercise of the powers conferred under Section-22 (viii), read with the Section-30 of the Gujarat Agricultural Universities Act, 2004 (Gujarat No. 5 of 2004), the Academic Council of the University hereby makes the following Academic Regulation, namely, "Academic Regulations for Post Graduate Diploma in Data Science in Anand Agricultural University" (Under Rule No. 12.0 of Common Regulations (2023-24) for PG Programmes of SAUs).	
Rule-1.0	Short Title
	These Regulations may be called "Academic Regulations (2023-24) for Post Graduate Diploma in Data Science of Anand Agricultural University of Gujarat".
Rule-2.0	Commencement
	These regulations shall come into force from the beginning of the first semester of the academic year 2023-24.
Rule-3.0	Interpretation
	If any question relating to the interpretation of the provision/s contained in the regulation arises, the Registrar of the Anand Agricultural University may issue necessary orders in consultation with the Dean Post Graduate Studies as and when needed, with prior approval of the Vice Chancellor, Anand Agricultural University, Anand.
Rule-4.0	Definitions
	In this Regulations, unless the context otherwise requires
	1. 'Academic year' means the year normally commencing from the month of July/August and ending in the month of June/July of the following calendar year and shall consist of two semesters.
	2. 'Act' means Gujarat Agricultural Universities Act, 2004 (Gujarat Act No. 5 of 2004).
	3. 'Advisory Committee' means a committee comprising of concerned major guide, minor guide and 2 other faculty members.
	4. 'Centre' means a place for imparting training for Post Graduate Diploma in Data Science study and includes a Department/Centre of the University which carries out teaching/research/extension education in a discipline and is strong enough to undertake for Post Graduate Diploma in Data Science Study in the University.
	5. 'Course' means an organized subject matter in which instructions or a segment of subject matter carrying a specific number of credits in a semester is offered through a series of lectures, practical and skill orientation (work experience). It shall be an integral part of the curriculum.
	6. 'Course Content' means a concise outline of the subject-matter of a course, as may be laid by the Faculty of Agricultural Information Technology and approved by the Academic Council of AAU from time to time.
	7. 'Course Credit' or 'Credit' means one hour theory lecture or minimum two hours of laboratory practical work per week. In taking a course, a student shall attend a series of lectures, do laboratory work and submit assignments and reports as required. Course credit is the quantitative measure of the content of a course of instruction, especially with reference to the value of the course in relation to the total requirements for a Post Graduate Diploma.
	8. 'Credit load' means the quantum of credits undertaken by a student in a semester.
	9. 'Credit Point' means Grade Point x Credit of a course.
	10. 'Cumulative Grade Point Average (CGPA)' means the quotient of the total grade points obtained by a student in courses during the PG Diploma programme, divided by the total number of credits successfully completed.
	11. 'Curriculum' means a series of courses selected and designed to provide training to meet the prescribed requirements for a Post Graduate Diploma in Data Science.
	12. 'Grade Point (GP)' means marks obtained in a particular course converted into 10 point scale up-to next single decimal place. $GP = \frac{(\text{Theory Marks} \times \text{Theory credit}) + (\text{Practical Marks} \times \text{Practical credit})}{\text{Total Credits of Course}}$
	13. 'Grade Point Average (GPA)' means the weighted average of the grade point earned by a student for the courses registered during the semester. Explanation: GPA is the sum of the products of credits of a course and the grade point obtained

		in the course divided by the total number of credits of the different courses registered in the semester i.e.
		$\text{GPA} = \frac{G_1C_1 + G_2C_2 + \dots + G_nC_n}{C_1 + C_2 + \dots + C_n} = \frac{\text{Total Grade Points}}{\text{Total Course Credits}}$ OR $\text{GPA} = \frac{\sum (\text{Course Credit} \times \text{Course Grade Point})}{\sum \text{Course Credits}}$
	14.	'Overall Grade Point Average (OGPA)' means the quotient of the total credit points obtained by a student in all courses during the PG Diploma programme, divided by the total number of credits successfully completed.
	15.	'Programme of Study' means a series of coherent courses and a project work assigned to a student to provide training to meet the requirements of a Post Graduate Diploma in Data Science.
	16.	'Rules' means the rules promulgated for the Post Graduate Diploma in Data Science Studies in the Anand Agricultural University of Gujarat.
	17.	'Semester' means an academic period of 20 to 22 weeks (including semester-end examination) during which a course is completed. There are two semesters in an academic year. The academic calendar shall be decided by the Admission Committee and circulated by the Registrar of Anand Agricultural University, Anand. Suitable adjustment in a semester will be made to accommodate vacations and other holidays as notified by the University.
	18.	'Statute' means the statute made under the Gujarat Agricultural Universities Act, 2004 (Gujarat Act No. 5 of 2004).
	19.	'State Council' means the Council of State Agricultural Universities constituted under Section-25 of the Act.
	20.	'Transcript' is the consolidated report of list of courses completed by the student along with credit points, GPA of each semester and OGPA secured and issued by the University.
	21.	'Website' means the official website for the purpose of admissions in AAU to carry out admission process.
		Note: Words and expressions used in the Act, Statutes and Regulations and not defined in these Regulations shall have the meaning assigned to them in the Act, Statutes and Regulations as the case may be.
Rule-5.0	Anand Agricultural University of Gujarat	
	The Post Graduate Diploma in Data Science shall be awarded by the Faculty of Agricultural Information Technology, Anand Agricultural University of Gujarat.	
Rule-6.0	Admission Committee	
	Admission Committee for Post Graduate Diploma in Data Science to regulate the admission of candidates to Post Graduate Diploma in Data Science in the AAU will be as under;	
	6.1	Members of Admission Committee
		1. The Registrar of AAU
		2. The Director of Research and Dean P.G. Studies of AAU
		3. Dean of Faculty of Agricultural Information Technology
		4. Member Secretary (Assistant Registrar, Academic)
	The Committee has to carry out the admission process in a fair and transparent manner. The admission process has to be conducted by this Committee strictly on the basis of merit, provisions made in these rules. The functions of the Committee are as follows; ❖ The Committee shall supervise, monitor and control the entire process of admission. ❖ The Committee shall prepare the merit list in accordance with the provisions of the Act and the Rules made there under. ❖ The Committee shall allocate the regular seats in accordance with the provisions of the Act and the Rules made there under. ❖ The Committee shall ensure that admissions for the regular seats are made as per the merit list prepared.	

	6.2	While preparing the merit list, the Committee will observe rules or instructions as laid down in this regard by the university.																									
	6.3	The Dean, Faculty of Agricultural Information Technology, AAU, Anand shall verify physical fitness, original mark sheets, certificates, etc. of the candidates for their eligibility for admission to the said Post Graduate Diploma.																									
Rule-7.0	Number of Students to be admitted																										
	The maximum number of candidates to be admitted in first semester of the Post Graduate Diploma in Data Science will be in accordance to the intake capacity decided by the Anand Agricultural University from time to time.																										
Rule-8.0	Invitation of Application																										
	The Registrar shall invite online applications for the Post Graduate Diploma in Data Science by an admission notice published in leading Newspapers and on the website of AAU.																										
Rule-9.0	Post Graduate Diploma in Data Science Programme																										
	9.1	The duration of the Post Graduate Diploma in Data Science programme shall be two semesters (One Year).																									
	9.2	1. Gujarat domicile and pass out students of SAUs/KU/GNFOAU of Gujarat State shall be eligible, further pass-out students of SAUs/KU/GNFOAU of Gujarat and non-domicile of Gujarat State shall be considered for admission only for remaining vacant seats. 2. Candidate should have Bachelor's/ Master's degree in any discipline/branch from a recognized SAUs/KU/GNFOAU of Gujarat State for admission to Post Graduate Diploma in Data Science. 3. A candidate for admission to Post Graduate Diploma in Data Science should have the minimum requirement of marks at the bachelor's / Master's degree level as under. <table><tr><th rowspan="2">Sr. No.</th><th colspan="2">Per cent / O.G.P.A. obtained in Qualifying Exam</th><th rowspan="2">Per cent /O.G.P.A (Out of)</th></tr><tr><th>General/EWS*</th><th>SEBC **/ST/SC/PwD/ Sponsored Candidate</th></tr><tr><td>1.</td><td>60 %</td><td>55 %</td><td>Traditional System out of 100 %</td></tr><tr><td>2.</td><td>6.0</td><td>5.5</td><td>10 Point</td></tr></table> * Valid Economically Weaker Section certificate as per resolution no. EWS/122019/45903/A dated 25/1/2019 of Department of Social Justice & Empowerment, Government of Gujarat, Gandhinagar. ** Valid Non-creamy layer certificate for Gujarat domicile is required as per Government Resolution No. SSP/122015/455246/A dt.26/04/2016 of Department of Social Justice & Empowerment, Government of Gujarat, Gandhinagar.			Sr. No.	Per cent / O.G.P.A. obtained in Qualifying Exam		Per cent /O.G.P.A (Out of)	General/EWS*	SEBC **/ST/SC/PwD/ Sponsored Candidate	1.	60 %	55 %	Traditional System out of 100 %	2.	6.0	5.5	10 Point									
Sr. No.	Per cent / O.G.P.A. obtained in Qualifying Exam		Per cent /O.G.P.A (Out of)																								
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1.	60 %	55 %	Traditional System out of 100 %																								
2.	6.0	5.5	10 Point																								
	9.3	The sportsmen / women will be given marks for the admissions in Post Graduate Diploma in Data Science as follows <table><tr><th>No.</th><th>Level of Participation</th><th>Marks</th></tr><tr><td>(i)</td><td>Participation at the International Level</td><td>7</td></tr><tr><td rowspan="4">(ii)</td><td>Participation at the National Level/All India Inter- University Level</td><td>1 for participation</td></tr><tr><td>(a) Secured 1st position</td><td>5</td></tr><tr><td>(b) Secured 2nd position</td><td>3</td></tr><tr><td>(c) Secured 3rd position</td><td>2</td></tr><tr><td rowspan="2">(iii)</td><td>Participation at the State Level</td><td></td></tr><tr><td>(a) Secured 1st position</td><td>1</td></tr><tr><td></td><td>(b) Secured 2nd position</td><td>0.5</td></tr></table> Note: The benefit of the highest level of the above marks shall be given to the student only once during his/her university career.			No.	Level of Participation	Marks	(i)	Participation at the International Level	7	(ii)	Participation at the National Level/All India Inter- University Level	1 for participation	(a) Secured 1 st position	5	(b) Secured 2 nd position	3	(c) Secured 3 rd position	2	(iii)	Participation at the State Level		(a) Secured 1 st position	1		(b) Secured 2 nd position	0.5
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	(a) Secured 1 st position	1																									
	(b) Secured 2 nd position	0.5																									
Rule-10.0	Admission Procedure																										
	10.1	❖ Admissions shall be generally given at the beginning of odd semester only, subject to the intake capacity and other infrastructure facilities available at the Anand Agricultural University. ❖ The entrance test shall be either computer based mode or OMR based and question papers shall comprise of 100 Multiple Choice Questions (MCQs) and duration of examination shall be 1 hour.																									

		❖ The basis of selection of candidate for the admission shall be the merit. The merit list shall be prepared by giving 50:50 weightages to the marks of OGPA (percentage marks) of the last degree and common entrance test, additionally the marks of sports/cultural activities shall also be added before preparing the merit list. Separate merit list for Gujarat domicile students pass-out from SAUs/KU/GNFOAU of Gujarat State and non-domicile of Gujarat state students pass-out from SAUs/KU/GNFOAU of Gujarat shall be prepared. ❖ The candidates shall remain present on prescribed date, time and venue for counseling. The aforesaid admission committee shall admit candidates as per his/her merit and availability of seats however; the admission shall be treated as confirmed on receipt of admission fee at the time of counseling. Therefore, all candidates must come well prepared for submission of prescribed fee at the time of counseling. The decision of the admission committee shall be final in all respect. Such admitted candidates shall have to report to College of Agricultural Information Technology on prescribed date.	
10.2	For admission to Post Graduate Diploma in Data Science, the paper for entrance test shall include MCQs related to general awareness of agriculture and allied sciences, logical and verbal reasoning, general awareness, GK, quantitative aptitude and English grammar. Duration of the entrance test will be of one hour and total marks will be 100.		
10.3	Sponsored employees of the Agricultural Universities of Gujarat/Central Government/ICAR/other Agricultural Universities/Institutes/other organizations shall not be required to appear in the entrance test.		
10.4	If an employee of any State Government, Government of India, ICAR or other Agricultural University or Public / Co-operative Organization, is permitted by respective organization to pursue his/her studies leading to Post Graduate Diploma in Data Science shall be admitted; 1. On merit basis 2. Subject to fulfillment of the minimum requirements. 3. Sponsored candidate should produce deputation letter/ sponsorship letter/study leave of 1 years duration letter from employer on or before counseling for Post Graduate Diploma in Data Science. 4. Subject to intake capacity and infrastructure available.		
Rule-11.0 Reservation of Seats			
The University shall reserve seats for admission of the candidates as under;			
11.1	For the candidates who are domicile from the Gujarat state For the candidates nominated/sponsored by Government of Gujarat/other organizations		
11.2	The University shall reserve seats for admission of the candidates belonging to following categories		
Sr. No.	Particulars of Seats	Reservation (%)	Remarks
(1)	Schedule Caste (SC)	7	Reservation of these seats shall be interchangeable among SC / ST candidates.
(2)	Schedule Tribes (ST)	15	
(3)	Socially and Educationally Backward Communities (SEBC)	27	As specified by the Government of Gujarat and does not fall under Creamy layer section.
(4)	Person with Disabilities (PwD)	5	It will be adjusted against respective category.
(5)	Children of defense personnel and Ex-service man (Army)	1	---
Provided that nothing in this regulation shall require the University to admit candidates larger in number or with academic and other qualifications lower than those prescribed except in situation as in Regulation.			
Rule-12.0 General conditions regarding reservation			
12.1	If sufficient number of candidates of reserve categories (As per Rule 11.2) is not available, the vacant seats will be filled up by the candidates who are domicile of Gujarat in order of their merit. Vacant seats of Scheduled Castes and Scheduled Tribes will be filled up by other general		

		category candidates on merit basis.
	12.2	SC/ST and SEBC candidates who are able and wish to secure admission on merit in the general quota shall not, however, be counted against the seat reserved for them.
	12.3	A candidate availing benefit of the reserved seats shall be required to produce the certificate of belonging to a particular group from the competent authority. In case of any doubts or discrepancy about the castes/classes/group, the decision of the competent authority or the admission committee shall be treated as final.
Rule-13.0	Schedule Caste (SC) and Schedule Tribes (ST)	
	13.1	The total number of seats to be reserved for the Schedule Caste and Schedule Tribe candidates shall be as laid down by the State Government from time to time. The same at present is as follows (1) Twenty two percent of the total seats at the stage of admission shall be reserved for backward class candidates. Out of 22% seats, 7% shall be earmarked for the candidates belonging to scheduled castes and remaining 15% shall be earmarked for candidates belonging to schedule tribes. (2) Those candidates who are able to secure admission on merit shall not, however, be counted against the seat reserved for them.
	13.2	If the need arises on account of vacant seats due to less number of applications in one group and shortage of seats due to more number of application of eligible candidates in the other group, reciprocal adjustment in the above specified 7 % and 15 % seats between the two groups will be made.
	13.3	If applications from backward class candidates are more than the reserved seats earmarked for them as above, admission will be given to them strictly on merit within each of the two groups.
	13.4	The admission of a student of a reserved category on a reserved seat shall be valid subject to the verification of cast certificate issued by the authority empowered by the State Government in this behalf. In case, the caste certificate is found invalid on verification, he/she shall not have right to claim his/her admission on reserved seat and if he/she has been already granted admission, such admission shall be cancelled at any point of time.
Rule-14.0	Socially and Educationally Backward Communities (SEBC) & Economically Weaker Sections (EWS)	
	14.1	Twenty seven percent (27%) of seats shall be reserved for the Socially and Educationally Backward Class of Gujarat State as laid down by the State Government from time to time. The reservation shall be subject to the following conditions and shall be modified as per the directive of the State Government from time to time. The reservation shall be subject to fulfilment of the following conditions- (1) A candidate under this category shall be required to produce a Certificate that he/she belongs to a particular group of backward class (Caste) from the competent authority of the state. The candidate belonging to SEBC should produce the Certificate issued from the competent authority. (2) The candidate belonging to SEBC should produce the Certificate issued from the competent authority, showing that he/she does not belong to creamy layer sections of the society. Such certificate should be issued on or after the 1 st April of the academic year in which the candidate is seeking admission; otherwise he/she will not be considered under the SEBC category. (3) SEBC candidates, who are able to secure admission under open category merit shall not however, be counted against the seats reserved for them provided one has not availed any advantage of category. (4) The admission of a student of a reserved category on a reserved seat shall be valid subject to the verification of caste and non Creamy Layer certificate issued by the authority empowered by the State Government in this behalf. In case, the caste and non Creamy Layer certificate is found invalid on verification, he/she shall not have right to claim his/her admission on reserved seat and if he/she has been already granted admission, such admission shall be

		cancelled at any point of time.
	14.2	Ten percent (10%) of seats shall be reserved for Economically Weaker Sections (EWS), and this shall be followed as per the directives of the Government from time to time. * Valid Economically Weaker Section certificate as per resolution no. EWS/122019/45903/A dated 25/1/2019 of Department of Social Justice & Empowerment, Government of Gujarat, Gandhinagar.
Rule-15.0	Persons with Disabilities candidates	
	Five percent seats are reserved for the Persons with Disabilities candidates of Gujarat State which are adjustable within the respective category and subject to the following conditions;	
	(1)	A candidate, having locomotors disability of one leg and partial arm, shall be eligible to apply for admission to a Post Graduate Diploma programme course, subject to the submission of a Certificate to that effect from the Civil Surgeon / Medical Superintendent of the Government Hospital based on the opinion of the concerned specialist, that the locomotors disabled candidate is in a position to undertake the Post Graduate Diploma programme and can perform the functions of the concerned field. The admissions will be on the basis of inter se merit only.
	(2)	Persons with Disabilities candidate shall have to fulfil the academic and minimum requirements of marks at the qualifying examination of his/her category as mentioned in Rule- 11.0.
	(3)	The admission of a student of a reserved category on a reserved seat shall be valid subject to the verification of certificate issued by the authority empowered in this behalf. In case the certificate is found invalid on verification, he/she shall not have right to claim his/her admission on reserved seat and if he/she has been already granted admission, such admission shall be cancelled at any point of time.
	Candidates shall not be admitted to Post Graduate Diploma in Data Science, if he or she suffers the following disabilities, namely:- (a) Disability of total body including disability of chest or spine more than 50% (b) Disability of lower limb of more than 50% (c) Disability of upper limb (d) Visually handicapped candidates and those with hearing disability (e) Candidates with progressive diseases like myopathies, etc. (f) Disabilities which otherwise would interfere in the practical during study period.	
Rule-16.0	Foreign students	
	(1)	Foreign students will be admitted as per ICAR, New Delhi or Government of Gujarat/ICCR guidelines issued from time to time.
	(2)	The candidates admitted on Foreign student's seat, where seats are available for foreign candidate shall have to pay additional fee in US \$ as may be prescribed by the University / ICAR / ICCR from time to time.
	(3)	The candidature for foreign students shall be considered only if they are sponsored/ recommended by their respective Government and / or by Government of India /State Government/ICAR/ ICCR.
	(4)	However, the total number of seats for admitting foreign students will be decided by the concerned University looking to infrastructural facility and availability of major guide/discipline.
Rule-17.0	Recognition of P.G. Diploma Teacher/ Project Guide	
	17.1	A teacher who desires to be recognized as post graduate teacher for P.G. Diploma teaching and for guiding P.G. Diploma project will apply at appropriate time to the Dean of Post Graduate Studies.
	17.2	All teachers holding Ph.D. degree shall be recognized for PG Diploma teaching.
	17.3	All teachers of the rank of at least Assistant Professors holding Master degree and having minimum three years' experience of undergraduate teaching/research/extension will be recognized for post graduate teaching only and the teacher who has at least three years research/teaching/extension experience of post graduate teaching and who has published at least two research papers in recognized research journals will be recognized for guiding PG Diploma students only.

Rule-18.0	Procedure of granting recognition of post graduate diploma teachers/Project Guides	
	18.1	The Dean of post graduate studies shall grant recognition on the recommendation of the Head of the Department/Professor in charge/coordinator and Dean of Agricultural Information Technology in all cases where the academic attainment is in consonance with the prescribed standards as laid down in Rule-17 .
	18.2	In the cases of persons in respect of whom qualification or experience is not as per the prescribed standards as laid down in regulations, such cases may be treated as special cases.
	18.3	There shall be a committee comprising of the following members for considering the special cases to grant recognition of post graduate teachers. (1) The Director of Research & Dean Post Graduate Studies (2) Dean of Agricultural Information Technology
Rule-19.0	Appointment of P.G.T. In-charge at college level	
	From amongst the recognized Post-Graduate guides at College, the Dean of Post-Graduate Studies will appoint a PGT In-charge on rotation basis for the purpose of Post-Graduate studies at the college level. PGT in-charge shall supervise the duties of allotment of courses to recognized PG, overall supervision of PG Diploma teaching, examination, submission of project and project evaluation at college level. He/she shall also coordinate the work related to PG Time-Table, Semester End Examinations, Correspondence related to PG studies <i>etc.</i>	
Rule-20.0	Registration	
	20.1	A candidate selected for admission, shall report to the Dean of the College Agricultural Information Technology on the date specified by the University for the purpose of First Registration.
	20.2	The admission of the candidate, who failed to report to the concerned College on the specified date, shall be treated as cancelled.
	20.3	A candidate, who is not in a position to report for first registration on the specified date due to unavoidable circumstances, may register by paying fee through post or by messenger on or before the date specified for registration.
	20.4	A candidate, registered in the first semester by payment of fee must complete the registration of course within a period of ten days from the date of his/her registration.
	20.5	The First Registration shall consist of the following; (1) Payment of Fee at the time of counselling / interview (2) Production of original documents, Migration / Transfer Certificate as per Rule 24.0
	20.6	A student enrolled in the University shall be given a registration number, which shall be used along with his/her name in all the documents and correspondence pertaining to him.
	20.7	If an enrolled PG Diploma Student joins a regular service before submitting Project Report, his/her registration shall automatically be cancelled. Further, absence of three month or more without permission and non-deposition of fee shall also lead to cancellation of registration. Moreover on request of PG Diploma student admission/registration will be cancelled.
Rule-21.0	Renewal of Registration	
	21.1	Every enrolled student shall be required to register at the beginning of each semester till the completion of his/her PG Diploma requirements, unless otherwise permitted by the Dean / Principal, failing which his/her enrolment shall be cancelled. Re-registration in such cases shall be as per the University Norms.
	21.2	For the subsequent semester Registration and renewal of registration, required fee shall have to be paid within a month from the commencement of the semester, failing which his/her registration shall stand cancelled.
	21.3	The registration in person for subsequent semester should be completed within the first three days of beginning of the semester, failing which fine of ` 100/-per day (subject to revision from time to time), up to the permissible period of 30 days only, will have to be paid by the student who missed registration.

Rule-22.0	Identity Card				
	An Identity Card shall be issued by the Dean AIT to each registered student on completion of first registration. The student shall carry it with him / her at all the times and should show the same when asked for. In case the Identity Card is lost, a new one shall be issued on payment of fee as prescribed by the University from time to time.				
Rule-23.0	Migration of Student				
	(1)	Students migrating from SAUs of Gujarat shall not be required to apply for migration certificate.			
	(2)	Students migrating from other universities of the Gujarat State as well as the universities or statutory examining bodies outside the Gujarat State and seeking admission in the SAUs/KU/GNFOAU of Gujarat shall be required to produce Migration Certificate. No student from other University or statutory examining body shall finally be admitted to any Institute/College without production of migration certificate signed by the competent authority of the concerned University.			
Rule-24.0	Re-Registration				
	24.1	A Post Graduate Diploma in Data Science programme who has successfully completed all the requirements of 1 st semester of diploma programme may be re-registered within a period of one year for the 2 nd semester, provided that no disciplinary action has been taken against such a student previously.			
	24.2	This period of absence will be calculated from the date on which he/she left the College.			
	24.3	Only one such chance will be given for re-registration to the students who discontinue the studies.			
Rule-25.0	Fees and Deposits				
	25.1	The kinds of fees and deposits for this PG Diploma course shall be as under:			
	A	Fees and deposits for all new student to be paid once at the time of Registration			
		1	Caution Money	2	Hostel Deposit
		3	Mess Deposit	4	Electric Deposit
		5	Identity Card Fee	6	Test fee for Thalassemia
		7	Magazine Fee	8	Student Aid Fund
		9	General Amenities		
	B	Semester fees to be paid at beginning of each semester			
		1	Registration Fee	2	Tuition Fee
		3	Library Fee	4	Examination Fee
		5	Gymkhana Fee	6	Cultural Activities Fee
		7	Laboratory Fee	8	Hostel Fee
		9	Fees for Marks sheets, Certificates, Transcripts, etc.		
	25.2	The rate of fees shall be as determined by the University from time to time.			
	25.3	The girl students shall be exempted from paying the tuition fees and hostel fees as per the policy of the State Government from time to time.			
Rule-26.0	Refund of Fees / Deposits				
	If the student desires to cancel his admission, fees paid shall not be refunded.				
Rule-27.0	Academic requirement				
	27.1	To earn PG Diploma in Data Science, an enrolled student shall have to complete satisfactorily the prescribed number of course credits and earned an overall grade point average (OGPA) of 6 and above.			
	27.2	A course includes lectures and / or practical classes in a particular subject covered in a semester.			
	27.3	A student shall be required to earn the credits specified for the PG Diploma inclusive of those for Project work etc.			
	27.4	In pursuing course, a student will be required to attend lectures classes and/ or perform practicals inlaboratory / field etc. He/She shall also put required efforts in library work and shall submit the assignments, reports etc. as per instructions from the course teachers.			

Rule-28.0	System of Teaching	
	28.1	There will be two semesters during which the student shall complete the requirements of course credits under the semester system of teaching and continuous evaluation.
	28.2	An academic year shall normally commence in the month of July/August and end in the month of June/July of the following calendar year. It shall be divided into two semesters each of 20 to 22 weeks (including semester- end -examinations).
	28.3	The medium of instruction and examination shall be English.
	28.4	The first semester shall commence within two weeks after admission.
	28.5	There shall be two semesters in an academic year. The semester will be announced in every academic calendar year by the Registrar. Suitable adjustment in a semester will be made to accommodate Diwali vacation, summer vacation and other holidays as may be notified by the University / State Government.
	28.6	Odd semester will normally be from July to December and even semester will be from January to June.
	28.7	Maximum time limit to obtain one year PG Diploma Course after first registration is 2 (Two) years.
Rule-29.0	Hostel Accommodation	
	29.1	Staying in hostel is compulsory for a student except when permitted by the concerned Dean under exceptional circumstances. Hostel facility is available at constituent colleges, for which, student will have to apply for accommodation in the hostel. A student admitted in the hostel will have to abide by disciplinary rules and regulations. A student admitted in the hostel will be provided with a set of furniture for use and he/ she shall be responsible for maintenance of such furniture. The general management of the hostel is vested with the Hostel Rector who works under the general directives of Dean / Principal of the concerned college.
	29.2	Only the registered student shall be allowed to stay in the hostel during the stipulated period of PG Diploma programme, except for the period as deemed fit by the concerned authority.
	29.3	Any student working under contractual services and drawing HRA shall not be permitted to stay in hostels.
Rule-30.0	Curriculum and Courses	
	30.1	The details of the courses, credits and curriculum of the course shall be approved by the Academic Council in consultation with faculty and the Boards of Studies of Post Graduate Studies from time to time. The distribution of courses for each semester shall be such, as may be decided by the University from time to time.
	30.2	Addition, substitution, and deletion of course(s) shall be permitted by the Dean, P.G. Studies on the recommendation by the advisory committee / Deans of the concerned College with due justification.
	30.3	A student shall be deemed to have cleared and completed a course, if he/she has attended the lectures and laboratory / field work and has completed all such other necessary requirements for the course and has obtained a requisite grade point.
	30.4	The Re-registration of a particular course shall be allowed only once (1 regular + 1 trial) to obtain the minimum required grade point. Failing on this, registration of the student will be cancelled automatically.
Rule-31.0	Attendance	
	31.1	Every student shall attend all lectures, practical, library work, study tours and the meetings with respective course teachers and advisory committee.
	31.2	Each course teacher shall maintain a record of student's attendance of each course taught by him in a semester.
	31.3	The attendance shall be counted from the date of commencement of the semester. All candidates are required to attend at least 75% of the lectures/practical/seminar. If a student fails to attend 75% of the total number of lectures/practical/seminar held during a semester, he/she shall not be eligible to appear at the semester-end examination and shall repeat the course(s) when offered. Dean Faculty shall grant 'I' grade on recommendation of course teacher under intimation to Registrar.
	31.4	In case of shortfall in attendance up to 5% in any given course, only upon unavoidable

		circumstances, the shortage may be condoned by the concerned Dean/Principal of the College. Moreover, Maternity leave may be granted as the prevailing Government Rule, subject to fulfilment of registration requirement.
	31.5	An additional 5% grace in attendance may be allowed by the Vice Chancellor on the recommendation of the Dean/Principal of the college concerned. The decision of the Vice Chancellor shall be final.
Rule-32.0	Examination	
	32.1	Semester-end examinations shall be held on such dates, time and places as the University may determine and must be completed so that the results are announced before the onset of the ensuing semester.
	32.2	It will be the responsibility of the student to apply in a prescribed format for appearing in the examination. The application should be accompanied with photocopy of the mark sheets of last semester-end examination, other prescribed Certificates, and examination fees. The application should be submitted through the principal on such date and time and at such Centre as the University may direct from time to time.
	32.3	Unless otherwise specially provided for, all examinations except practical and Viva-voce shall be conducted by means of printed or written papers.
	32.4	Failure to pass an examination will not disqualify the candidate from presenting himself on a subsequent occasion on a new application being forwarded and a fresh fee paid.
	32.5	The Dean shall have the power to exclude any candidate from a University examination on being satisfied that he is suffering from an infectious or contagious disease.
	32.6	The following shall regulate the paper setting and evaluation of semester-end theory examination: The question paper for semester-end theory examination shall be drawn and evaluated by the examiners appointed by the Registrar on recommendations of the Principal/Unit Head of CAIT.
	32.7	Semester-end Practical examination will be done jointly by the internal examiner (i.e., concerned course teacher) and external examiner appointed by the Registrar on recommendations of the Principal/Unit Head of the CAIT.
	32.8	A student shall not be promoted to the next semester, if he fails in more than three courses offered in the semester.
	32.9	A student shall not be permitted to appear at the semester-end examination of a particular course(s), if the concerned teacher reports that his academic performance is not satisfactory and / or that he has not satisfactorily carried out the laboratory, field, practical during the semester and / or he has not been regular in attending classes or he fails to appear in any of the examination (viz., at least one internal theory / practical test), he shall be awarded "I" (Incomplete) grade. His absence from the semester-end examination on his account shall be considered as a trial and will have to repeat that course. He will be eligible to take remaining one trial only after repeating the course(s) as and when they are offered.
	32.10	A student who fails to appear in any of the examinations (viz., at least one internal theory test, practical examination, semester end examination either in theory or in practical) shall be marked "Ab" (absent) and the value of "Ab" is to be taken as zero. He shall be given grade(s) in such course(s) with zero value for the absence in the examination in which he fails to appear.
	32.11	It is compulsory for the student to appear in the semester-end examination (both theory and practical) to earn grade(s) in the course(s), except he is not permitted to appear in the semester-end examination.
	32.12	There shall be no make-up examination for the semester-end examination.
Rule-33.0	Disciplinary Actions (Examinations)	
	33.1	A student found using unfair means or copying during an examination shall be liable to be expelled from the examination in the first instance by the conductor (Junior Supervisor/Senior Supervisor) and shall not be permitted to appear in the remaining examinations. The conductor shall report such cases to the Controller of Examination. (Dean)
	33.2	The Examination Committee shall have the power to impose any other punishment for misbehavior or misconduct of examinees.
	33.3	The Examination Committee shall examine the cases of unfair means and shall recommend to the Academic Council for suitable action.

Rule-34.0	Evaluation Responsibility		
	34.1	The teacher imparting instruction is solely responsible for evaluation of tests, semester-end examination. He is also responsible for maintaining all records to justify his evaluation and score thereof.	
	34.2	Neither the Dean/Principal nor the University authority shall have right to change the score assigned by a teacher. However, if the principal is convinced that the scores assigned by a teacher are biased, he shall appoint a committee where the teacher concerned will be a member for review. The decision of the committee shall be final and binding. The decision with the revised score shall be sent to the Registrar for necessary action.	
	34.3	A copy of the score assigned for each tests, semester-end examination, shall be submitted to the Dean/Principal by the concerned teacher for records and the Dean/Principal will be sent the same to the Registrar.	
Rule-35.0	System of Evaluation		
	35.1	A student securing less than 6.0 grade point (60 percent marks) for the course of PG Diploma programme shall be considered as fail; such student shall have to repeat the course as and when offered.	
	35.2	The mode of evaluation through the different types of examination and weightage for each course shall be as follows	
	A	Courses having theory and practical	
		Nature of Evaluation :	
	I	Internal Examination	Marks
		Two tests each of one hour duration and 15 marks	30
		Self Study (Assignment)	20
		Internal Practical Exam	40
	II	Semester-end Examination	Marks
		Theory examination	50
		Practical examination	60
	B	Courses having theory only	
	I	Internal Examination	Marks
		Two tests each of one hour duration and 15 marks	30
		Self Study (Assignment)	20
	II	Semester-end Examination	Marks
		Theory examination	50
	C	Courses having practical only	
	I	Internal practical Examination	40
		Semester-end practical examination	60
	D	Project Evaluation	
		Particulars	Marks
		Project: Project Title, Problem definition, Intern understands the level towards problem definition to execute the project and meet objectives.	25
		Project Final Outcome The outcome of project work. Level of the developed application, module, or any relevant work.	25
		Project Report Writing and Presentation Skill: Is the intern successfully communicated in writing to convey his/her outcome of a given project professionally? Dissertation format, literature review.	50
		Total Marks Obtained	
		Note : The course teacher will carry out the internal evaluation through different examination of theory and practical for each course as the case may be	

35.3	The evaluation made by the teachers / examiners in all examinations of a course shall be recovered to total score/weighted score and grade point. The following marking shall also be shown by the teachers/examiners/university in the students' performance evaluation:		
	Grade	Significance	Value
	Ab	Absent	For those students who do not appear in Internal/External Examination without giving any valid reason.
	W	Withdrawal	For those students who do not appear at semester-end examination due to unforeseen circumstances as certified by the Principal (in very exceptional cases only).
	I	Incomplete	Candidates not permitted to appear at the semester-end examination. As per Regulation-31.0 and Regulation-35.10.
	F	Fail	For those who appear, but fail to score 60% a particular course.
R	Repeat	To be shown by University in evaluation report and transcript in case of course repeated and cleared.	
35.4	The Grade Point shall be calculated as below- $GP = \frac{(\text{Theory Marks} \times \text{Theory credit}) + (\text{Practical Marks} \times \text{Practical credit})}{\text{Total Credits of Course}}$		
	35.5	A grade point below 6.00 in a course shall be counted in working GPA for that semester. However, on revision of the grade point after repeating that course, the earlier grade point shall be replaced by the revised grade point average and CGPA/OGPA shall be recalculated.	
	35.6	The revised grade point shall substitute the original grade point and the same will be counted in working out the OGPA/CGPA for the purpose other than the award of the scholarship / fellowship or for competing for a Certificate of honor or of a position.	
	35.7	The course, cleared by more than one trial shall be shown as repeat course in the transcript as well as evaluation report of that semester.	
	35.8	A student who fails to appear in any of the examinations (viz., at least one internal theory test, practical examination, semester end examination either in theory or in practical) shall be marked "Ab" (absent) and the value of "Ab" is to be taken as zero. He shall be given grade(s) in such course(s) with zero value for the absence in the examination in which he fails to appear.	
	35.9	A student shall not be permitted to appear in the semester-end examination of course/courses if he fails to appear either one of hourly test or in practical test /examination of internal evaluation.	
	35.10	It is compulsory for the student to appear in the semester-end examination (both theory and practical) to earn grade(s) in the course(s), except he/she is not permitted to appear in the semester-end examination.	
	35.11	There shall be no make-up examination for the semester-end examination.	
Rule -36.0 Academic Probation			
36.1	A student shall be required to maintain the CGPA of not less than 6.50 in order to be eligible for continuing as regular enrolled student of the University.		
	36.2	If the CGPA of a student is less than 6.50 at the end of a semester, he/she shall be placed on the Academic Probation.	
	36.3	If the CGPA of student at the end of a semester in which he/she was on academic probation is 6.50 or higher, he/she shall be removed from the academic probation and shall be allowed to continue as a regular enrolled student. Otherwise, he/she will continue to be on academic probation till he/she obtains the OGPA of 6.50 or above by taking additional courses even after the successful completion of the prescribed courses.	
Rule-37.0 Award of Class			
37.1	The award of a class to a student shall be based on OGPA (Overall Grade Point Average) obtained by him/her and shall be indicated in the PG Diploma certificate only. The basis of the award of class shall be as under:		
	OGPA		Class
	8.00 and Above		First Class with Distinction
	7.00 to 7.99		First class
	6.50 to 6.99		Second class

	37.2	The class earned by a candidate shall be indicated in his/her PG Diploma Certificate subjected to change from time to time.
	37.3	Verification of the grade awarded will be permissible on payment of fees as prescribed by the University.
Rule-38.0	Prevention and Prohibition of Ragging	
	In view of the directions of the Honorable Supreme Court in SLP No. 24295 of 2006 dated 16-05-2007 and in Civil Appeal number 887 of 2009, dated 08-05-2009, following provisions will be effective to prohibit, prevent and eliminate the scourge of ragging including any conduct by any student or students whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness a fresher or any other student, or indulging in rowdy or undisciplined activities by any student or students which causes or is likely to cause annoyance, hardship or psychological harm or to raise fear or apprehension thereof in any fresher or any other student or asking any student to do any act which such student will not in the ordinary course do and which has the effect of causing or generating a sense of shame, or torment or embarrassment so as to adversely affect the physique or psyche of such fresher or any other student, with or without an intent to derive a sadistic pleasure or showing off power, authority or superiority by a student over any fresher or any other student, in all higher education institutions in the country, and thereby, to provide for the healthy development, physically and psychologically, of all students.	
	38.1	What Constitutes Ragging Ragging constitutes one or more of any of the following acts: (1) Any conduct by any student or students whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness a fresher or any other student; (2) Indulging in rowdy or undisciplined activities by any student or students which causes or is likely to cause annoyance, hardship, physical or psychological harm or to raise fear or apprehension thereof in any fresher or any other student; (3) Asking any student to do any act which such student will not in the ordinary course do and which has the effect of causing or generating a sense of shame, or torment or embarrassment so as to adversely affect the physique or psyche of such fresher or any other student; (4) Any act by a senior student that prevents, disrupts or disturbs the regular academic activity of any other student or a fresher; (5) Exploiting the services of a fresher or any other student for completing the academic tasks assigned to an individual or a group of students; (6) Any act of financial extortion or forceful expenditure burden put on a fresher or any other student by students; (7) Any act of physical abuse including all variants of it: sexual abuse, homosexual assaults, stripping, forcing obscene and lewd acts, gestures, causing bodily harm or any other danger to health or person; (8) Any act or abuse by spoken words, emails, posts, public insults which would also include deriving perverted pleasure, vicarious or sadistic thrill from actively or passively participating in the discomfiture to fresher or any other student; (9) Any act that affects the mental health and self-confidence of a fresher or any other student with or without an intent to derive a sadistic pleasure or showing off power, authority or superiority by a student over any fresher or any other student.
	38.2	Mandatory Discloser (1) Ragging is totally banned and anyone found guilty of ragging and/or abetting ragging is liable to be punished. (2) The affidavit-I should be filled up and signed by the candidate to the effect that he / she is aware of the law regarding prohibition of ragging as well as the punishments, and that he/she, if found guilty of the offence of ragging and / or abetting ragging, is liable to be punished appropriately. (3) The affidavit-II should be signed by the parent/guardian of the applicant to the effect that he/she is also aware of the law in this regard and agrees to abide by the punishment meted out to his/her ward in case the latter is found guilty of ragging and / or abetting ragging. (4) A student seeking admission to the hostel shall have to submit another affidavit□□□□ along

		with his/her application for hostel accommodation that he / she is also aware of the law in this regard and agrees to abide by the punishments meted out if he / she is found guilty of ragging and / or abetting ragging. (5) The first year students should desist from doing anything against their will even if ordered by the seniors, and that they have nothing to fear as the institution cares for them and shall not tolerate any atrocities against them. (6) A student securing admission to a particular institute shall have to submit concern affidavits to the Dean/Principal of institute.
	38.3	Actions to be taken against students for indulging and Abetting Ragging in SAUs (1) The punishment to be meted out to the persons indulged in ragging has to be exemplary and justifiably harsh to act as a deterrent against recurrence of such incidents. (2) Every single incident of ragging, a First Information Report (FIR) must be filed without exception by the institutional authorities with the local police authorities. (3) The Anti-Ragging Committee of the institution shall take an appropriate decision, with regard to punishment or otherwise, depending on the facts of each incident of ragging and nature and gravity of the incident of ragging. (4) Depending upon the nature and gravity of the offence as established the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following, (a) Cancellation of admission (b) Suspension from attending classes (c) Withholding/withdrawing scholarship/fellowship and other benefits (d) Debarring from appearing in any test/examination or other evaluation process (e) Withholding results (f) Debarring from representing the institution in any regional, national or international meet, tournament, youth festival, etc. (g) Suspension/expulsion from the hostel (h) Rustication from the institution for a period ranging from 1 to 4 semesters (i) Expulsion from the institution and consequent debarring from admission to any other institution (j) Collective punishment: when the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment as a deterrent to ensure community pressure on the potential raggers. An appeal against the order of punishment by the Anti-Ragging Committee shall lie, (1) In case of an order of an institution affiliated to or constituent part of the University, to the Vice Chancellor of the University; (2) In case of an order of a University, to its Chancellor; (3) In case of an institution of national importance created by an Act of Parliament, to the Chairman or Chancellor of the institution, as the case may be. The institutional authorities shall intimate the incidents of ragging occurred in their premises along with actions taken to the Council from time to time.
Rule-39.0	Unlawful Activities	
	In case of students found involved in any unlawful activities either within or outside the Hostel / College Campus, besides, expulsion both from the Hostel and College at the discretion of the Dean, the matter will be reported to the Police of the jurisdiction to be dealt with, in accordance with the appropriate law in force.	
Rule-40.0	Repeal & Savings	
	The regulations for the award of PG Diploma in University and amended from time to time and in force on the date this regulation comes into effect are hereby repealed. Moreover, possible amendments/revisions/modifications as suggested/mandated by ICAR, New Delhi through its BSMA committees nominated for updating/revising postgraduate programmes in Agricultural Universities shall be considered while enacting/executing these regulations	