Fourth Meeting of the Board of Studies

Department of Computational Studies

for the Programme

Bachelor of Data Science and Analytics

Venue

First Floor, SAS Block

Sri Manakula Vinayagar Engineering College

Madagadipet, Puducherry – 605 107

Date & Time

10-04-2024 & 10.00 pm to 01.00 pm

School of Arts and Science

Department of Computational Studies

Board of Studies Meeting for B.Sc. Data Science and Analytics

The fourth meeting of Board of Studies for the course B.Sc. Data Science and Analytics was held through online on 10.04.2024 at 10:00 am in the Department of Computational Studies, School of Arts and Science, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the Fourth Meeting of Board of Studies.

S. No.	Name of the Member with Designation and official Address	Responsibility in the BoS
1	**Dr. N. MOGANARANGAN, M.E., Ph.D.** Professor & Head, Department of Computational Studies, School of Arts & Science, Sri Manakula Vinayagar Engineering College (Autonomous) Madagadipet, Puducherry 605 107 E-mail: moganarangan.cse@smvec.ac.in **Mobile: 98945 33661**	Chairman
2	**Dr. PUNAM BEDI M.Sc., M.Tech., Ph.D.** Professor, Department of Computer Science, University of Delhi, Delhi – 110 007. Email: punambedi@gmail.com , Mobile:9899125785	Pondicherry University Nominee
3	**Dr. R. AROKIA PAUL RAJAN MCA, PGDBA, MA, PhD.,** Associate Professor, Computer Science, School of Sciences, Bangalore Central Campus, Christ University, Bangalore, Karnataka. Mail id: paulraajan@gmail.com, Ph: 9443459242	Subject Expert (Academic Council Nominee)
4	**Dr. M. DURAISAMY, MCA. M.Phil., Ph.D., TNSET.** Associate Professor and Head, Department of Computer Applications, Government Arts and Science College, Kariyampatti, Tirupattur, Tamilnadu - 635 901. E-mail: duraimca78@gmail.com, Mobile: 98431 55358.	Subject Expert (Academic Council Nominee)

5	**Mr.E.IYYAPPAN,** Senior Application Developer, IQVIA, Bangalore. **E-mail: eiyyappan.mca@gmail.com, Mobile:9790700670**	Member (Industry Representative)
Co-opted Expert Members		
6	**Dr. J. MADHUSUDANAN, ME., Ph.D.,** Professor and Head, Department of Artificial Intelligence and Data Science, Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry. 605 107. **E-mail: madhu@smvec.ac.in** **Mobile: 9003739274**	Co-opted Expert Member
7	**Mr. M. SHANMUGAM, M.Sc., M.Phil., M.E., SET, (Ph.D).,** Associate Professor, Department of Computer Science Engineering, Sri Manakula Vinayagar Engineering College **E-mail: shanmugam.mm@smvec.ac.in** **Mobile: 9444370963**	Co-opted Expert Member
Internal Members		
8	**Mrs. A. SHAMSATH BEGAM, M.C.A.,** Assistant Professor, Department of Computational Studies, School of Arts and Science, Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry. 605 107. **E-mail: shamsathbegum.sas@smvec.ac.in, Mobile: 9500399774**	Internal Member
9	**Mr. K. SANTHOSHKUMAR, M.C.A. M.Phil. B.Ed.,** Assistant Professor Department of Computational Studies School of Arts and Science Sri Manakula Vinayagar Engineering College **Mail id: santhoshkumark.sas@smvec.ac.in, Phone: 8508068040.**	Internal Member
10	**Dr. M.A. ISHRATH JAHAN M.A., M.Phil., Ph.D.,** Associate Professor & Head, Department of English, School of Arts and Science, Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry. 605 107. **E-mail: ishrath@smvec.ac.in, Mobile: 9443075126.**	Internal Member
11	**Mr. P.KRISHNAMOORTHY M.Sc., M.Phil.,** Assistant Professor and Head, Department of mathematics, School of Arts and Science, Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry. 605 107. **E-mail: krishnamoorthymaths@smvec.ac.in, Mobile: 9750028056.**	Internal Member

ANNEXURE – II

AGENDA OF THE MEETING

Item No.: BoS/2024/SAS/DSA / 4.1

❖ Confirmation of Minutes of 3rd Meeting of BOS - Modifications if any.

Item No.: BoS/2024/SAS/DSA / 4.2

❖ To discuss the criteria for fixing (MJD) Major Disciplinary Courses, (MID) Minor Disciplinary Courses, (MLD) Multi Disciplinary Courses, (AEC) Ability Enhancement Courses, (SEC) Skill Enhancement Courses and (VAC) Value Added Courses from semesters II-VIII.
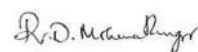
Item No.: BoS/2024/SAS/DSA / 4.3

❖ To discuss the curriculum framework for the UG programme B.Sc. Data Science and Analytics for semesters (I – VIII) based on National Education Policy Regulations 2023 of Pondicherry University.

Item No.: BoS/2024/SAS/DSA / 4.4

❖ To discuss the already approved curriculum R2020 and the syllabus of Semester V and Semester VI.

❖ To add Value Added Course – Understanding India in II semester.

Item No.: BoS/2024/SAS/DSA / 4.5

❖ Any other additional points to be discussed with the permission of the chair.

SCHOOL OF ARTS AND SCIENCE

Department of Computational Studies

B.Sc. Data Science and Analytics

Minutes of 4th meeting of Board of Studies

ANNEXURE – I

ACADEMIC REGULATIONS 2020

(R 2020)

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of livesto serve the society.

Mission

M1: Quality Education:

To provide comprehensive academic system that amalgamates the cutting-edge technologies with bestpractices.

M2: **Research and Innovation:**

To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship:

To inculcate the employability and entrepreneurial skills through value and skill-based training.

M4: Ethical Values:

To instil deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT OF COMPUTATIONAL STUDIES

VISION AND MISSION

Vision:

To come up with successfully as a high-quality human capital in Computer Science and related areas for thesustainable growth of the IT industry needs of the country.

Mission:

M1: Innovative Skills:

Ensuring deeper understanding of fundamentals and acquiring innovative skills within core areas of ComputerScience.

M2: Motivated Graduates:

Producing highly skilled and motivated graduates with the ability of problem solving individually and in teams.

M3: Ethical Responsibilities:

Providing a deep awareness of our ethical responsibilities to our profession and to the society.

S. No	Course Code	Course Title	Category	Periods L	T	P	Credits	CAM	ESM	Total
		SEMESTER - VI								
Theory										
1	A20DAT612	Deep Learning	DSC	4	0	0	4	25	75	100
2	A20DAT613	Data Handling and Visualization	DSC	4	0	0	4	25	75	100
3	A20DAT614	Text and Image Analytics	DSC	4	0	0	4	25	75	100
4	A20DAE6XX	**Discipline Specific Elective–IV**	DSE	3	0	0	3	25	75	100
Practical										
5	A20DAP602	Project Work & Viva-voice	DSC	0	0	10	5	40	60	100
Skill Enhancement Course										
6	A20DAS606	Research Methodology	SEC	0	0	4	2	100	0	100
							22	**240**	**360**	**600**

DISCIPLINE SPECIFIC ELECTIVES

Sl. No	Course Code	Course Title	Category	Periods L	T	P	Credits	CAM	ESM	Total
Discipline Specific Elective (DSE - I) – offered in Third Semester										
1	A20DAE301	Operating System	DSE	3	-	-	3	25	75	100
2	A20DAE302	Information Security	DSE	3	-	-	3	25	75	100
3	A20DAE303	Computer Networks	DSE	3	-	-	3	25	75	100
Discipline Specific Elective (DSE - II) – offered in Fourth Semester										
1	A20DAE404	Infrastructure Management	DSE	3	-	-	3	25	75	100
2	A20DAE405	Client Server Technology	DSE	3	-	-	3	25	75	100
3	A20DAE406	Image Processing	DSE	3	-	-	3	25	75	100
Discipline Specific Elective (DSE - III) – offered in Fifth Semester										
1	A20DAE507	Wireless Sensor Network	DSE	3	-	-	3	25	75	100
2	A20DAE508	Data Science using R	DSE	3	-	-	3	25	75	100
3	A20DAE509	Virtualization using Cloud	DSE	3	-	-	3	25	75	100
Discipline Specific Elective (DSE - IV) – offered in Sixth Semester										
1	A20DAE610	Process Management	DSE	3	-	-	3	25	75	100
2	A20DAE611	Software Engineering	DSE	3	-	-	3	25	75	100
3	A20DAE612	Introduction to Digital Marketing	DSE	3	-	-	3	25	75	100

Department	**Computational Studies**	Programme: **B.Sc Data Science and Analytics**						
Semester	**Sixth Semester**	Course Category Code: **DSC** *End Semester Exam Type: **TE**						
Course Code	**A20DAT612**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Deep Learning**	**4**	**0**	**0**	**4**	**25**	**75**	**100**

Prerequisite	Basic Knowledge in Deep Learning	

Course Outcome	*After the completion of this course, the students will be able to:*	BT Mapping (Highest Level)
	CO1 Understand the deep learning concepts and apply for different problems	**K2**
	CO2 Design and apply Convolutional and Recurrent Neural Networks	**K3**
	CO3 Understand and evaluate different deep learning architectures	**K3**
	CO4 Design and create deep learning applications	**K4**
	CO5 Analyse the role of deep learning models in image processing	**K4**

UNIT-I	**BASICS OF NEURAL NETWORKS**	**Periods: 12**
Basics of neural networks - Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.		**CO1**
UNIT-II	**INTRODUCTION TO DEEP LEARNING**	**Periods: 12**
Introduction to deep learning - Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – RelU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent – Regularization – Dropout		**CO2**
UNIT-III	**CONVOLUTIONAL & RECURRENT NEURAL NETWORK**	**Periods: 12**
Convolutional neural networks - Kernel Filters – Multiple Filters - CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning - Introduction to RNNs, Unfolded RNNs, Seq2Seq RNNs, LSTM, RNN applications		**CO3**
UNIT-IV	**DEEP LEARNING ARCHITECTURES**	**Periods: 12**
LSTM, GRU, Encoder/Decoder Architectures – Auto encoders – Standard- Sparse – Denoising – Contractive- Variational Auto encoders – Adversarial Generative Networks – Auto encoder and DBM		**CO4**
UNIT-V	**APPLICATIONS OF DEEP LEARNING**	**Periods: 12**
Applications of deep learning - Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative Adversarial Networks – Video to Text with LSTM Models – Attention Models for Computer Vision		**CO5**

Lecture Periods: 60	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 60**

Text Books

1. Ian Good Fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.
2. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
3. Deep Learning, Ian Goodfellow, Yoshua Bengio and Aeron Courville, MIT Press,First Edition, 2016.
4. Deep Learning, A practitioner's approach, Adam Gibson and Josh Patterson, O'Reilly, First Edition, 2017.
5. Hands-On Learning with Scikit-Learn and Tensorflow, Aurelien Geron, O'Reilly, First Edition, 2017.

Reference Books

1. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.

2. Phil Kim, "Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence", Apress , 2017.
3. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018
4. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.
5. Joshua F. Wiley, "R Deep Learning Essentials", Packt Publications, 2016

Web Reference

1. https://onlinecourses.nptel.ac.in/noc20_cs88/preview

* TE – Theory Exam, LE – Lab Exam

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10	5	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**		Programme: **B.Sc DATA SCIENCE AND ANALYTICS**				
Semester	**Sixth Semester**		Course Category Code: DSC		*End Semester Exam Type: **TE**		
Course Code	**A20DAT613**		Periods / Week		Credit	Maximum Marks	
			L	T	P	C	CAM	ESE	TM
Course Name	**Data handling and visualization**		4	0	0	4	25	75	100
Prerequisite	Basic Knowledge in Data handling and visualization								

Course Code	**A20DAT613**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Data handling and visualization**	4	0	0	4	25	75	100
Prerequisite	Basic Knowledge in Data handling and visualization							

Course Objectives	• To understand the principles and processes of Data Analysis (DA) and its significant the data. • To learn and apply various data transformation techniques for effective data handling. • To gain proficiency in using Matplotlib and Seaborn for creating insightful visualizations. • To analyse datasets using univariate, bivariate, and multivariate analysis techniques. • To develop skills in time series analysis and visualization for longitudinal data.	

Course Outcome	*After the completion of this course, the students will be able to:*		BT Mapping (Highest Level)
	CO1	Apply Data Analytics fundamentals to make sense of data	**K2**
	CO2	Create a variety of visualizations using Matplotlib and Seaborn	**K3**
	CO3	Perform univariate analysis and apply standardization techniques.	**K3**
	CO4	Conduct bivariate analysis and use transformations effectively.	**K4**
	CO5	Execute resampling methods for in-depth insights.	**K4**

UNIT-I	INTRODUCTION TO DATA ANALYSIS	Periods: 12	
Data Analysis fundamentals – Understanding data science – Significance of Data Analysis – Making sense of data – Comparing Data Analysis with classical and Bayesian analysis – Software tools for Data Analysis – Visual Aids for Data Analysis – Data transformation techniques – merging database, reshaping and pivoting, Transformation techniques – Grouping Datasets – data aggregation – Pivot tables and cross-tabulations.			CO1

UNIT-II	VISUALIZING USING MATPLOTLIB	Periods: 12	
Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three-dimensional plotting – Geographic Data with Basemap – Visualization with Seaborn.			CO2

UNIT-III	UNIVARIATE ANALYSIS	Periods: 12	
Introduction to Single Variable: Distributions and Variables – Numerical Summaries of Level and Spread – Scaling and Standardizing – Inequality – Smoothing Time Series.			CO3

UNIT-IV	BIVARIATE ANALYSIS	Periods: 12	
Relationships between Two Variables – Percentage Tables – Analysing Contingency Tables Handling Several Batches – Scatterplots and Resistant Lines – Transformations.			CO4

UNIT-V	MULTIVARIATE AND TIME SERIES ANALYSIS	Periods: 12	
Introducing a Third Variable – Causal Explanations – Three-Variable Contingency Tables and Beyond – Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.			CO5

Lecture Periods: 60		Tutorial Periods: -	Practical Periods: -		Total Periods: 60

Text Books

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st

Edition, 2016.
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008.

Reference Books

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'Reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC Press, 2015.

Web References

1. https://online.hbs.edu/blog/post/data-visualization-examples
2. https://www.founderjar.com/best-data-visualization-tools/
3. https://crayondata.ai/20-web-based-visualisation-tools/
4. https://webflow.com/blog/data-visualization-tools

* TE – Theory Exam, LE – Lab Exam

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**	Programme: **B.Sc Data Science and Analytics**					
Semester	**Sixth Semester**	Course Category Code: **DSC** *End Semester Exam Type: **TE**					
Course Code	**A20DAT614**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Text and Image Analytics**	4	0	0	4	25	75	100
Prerequisite	Basic Knowledge in Text and Analytics							

Course Outcome	*After the completion of this course, the students will be able to:*	BT Mapping (Highest Level)
	CO1 Understand the basics of text analysis	**K2**
	CO2 Will be able to analyse the text parts	**K3**
	CO3 Will be able to analyse the text and to classify them into categories	**K3**
	CO4 Understand the basics of Image analysis	**K4**
	CO5 Will be able to analyse the image and to classify them into categories	**K4**

UNIT-I	INTRODUCTION	Periods: 12
Introduction to Text Analytics - Introduction: Text Analytics: What Is It? - Origins and Timeline of Text Analytics - Text Analytics in Business and Industry - Text Analytics Skills - Benefits of Text Analytics - Text Analytics Process Road Map - Fundamental of content analysis – Deductive Vs Inductive Approaches.		**CO1**

UNIT-II	PROCESSING AND UNDERSTANDING TEXT	Periods: 12
Text Tokenization - Sentence Tokenization - Word Tokenization - Text Normalization - Cleaning Text - Tokenizing Text - Removing Special Characters - Expanding Contractions - Case Conversions - Removing Stop words - Correcting Words - Stemming – Lemmatization.		**CO2**

UNIT-III	TEXT CLASSIFICATION AND SUMMARIZATION	Periods: 12
Introduction about Text Classification - automated Text classification- blue print- Text 63 Normalization - Feature Extraction- Automated Text Classification - Text Summarization - Text Summarization and Information Extraction-concepts-topic modelling-automated Document Summarization		**CO3**

UNIT-IV	IMAGE FUNDAMENTALS	Periods: 12
Introduction – Elements of visual perception, Steps in Image Processing Systems – Digital Imaging System - Image Acquisition – Sampling and Quantization – Pixel Relationships – File Formats – colour images and models - Image Operations – Arithmetic, logical, statistical and spatial operations.		**CO4**

UNIT-V	IMAGE ANALYSIS AND CLASSIFICATION	Periods: 12
Image segmentation- pixel based, edge based, region based segmentation. Active contour models and Level sets for medical image segmentation, Image representation and analysis, Feature extraction and representation, Statistical, Shape, Texture, feature and statistical image classification.		**CO5**

Lecture Periods: 60	Tutorial Periods: -	Practical Periods: -	Total Periods: 60

Text Books

1. Text Analytics with Python- A Practical real- World Approach to Gaining Actionable Insights from your data, Dipanjan Sarkar,Apress, 2016
2. Practical Text Analytics- Maximizing the value of Text Data, Murugan Anandarajan, Chelsey Hill, Thomas Nolan, Springer, Vol. 2, 2019
3. Alasdair McAndrew, ―Introduction to Digital Image Processing with Matlab‖, Cengage Learning 2011,India

Reference Books

1. Applied Text Analysis with Pythod- Enabling language-aware data products with machine learing, Benjamin bengfort, Rebecca bilbro &Tony Ojeda, O'reilly, 2018

2. Seven Layers of Social Media Analytics_ Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data,Gohar F. Khan, EBook , 2015

* TE – Theory Exam, LE – Lab Exam

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**	Programme: **B.Sc Data Science and Analytics**						
Semester	**Sixth Semester**	Course Category Code: **DSE** *End Semester Exam Type: **TE**						
Course Code	**A20DAE612**		Periods / Week			Credit	Maximum Marks		

Department	**Computational Studies**	Programme: **B.Sc Data Science and Analytics**							
Semester	**Sixth Semester**	Course Category Code: **DSE** *End Semester Exam Type: **TE**							
Course Code	**A20DAE612**		L	T	P	C	CAM	ESE	TM
Course Name	**Process Management**		3	0	0	3	100	-	100
Prerequisite	Basic Knowledge in Process Management								

Course Outcome	After the completion of this course, the students will be able to:		BT Mapping (Highest Level)
	CO1	Explain the basic aspects of research and its ethics	**K2**
	CO2	Outline research problems, their types and objectives	**K3**
	CO3	Formulate good research designs and carry out statistically relevant sampling	**K3**
	CO4	Collect, collate, analyse and interpret data systematically	**K4**
	CO5	Make use of literature and other search engines judiciously for research purposes	**K4**

UNIT-I	**Introduction to Process Management**	**Periods: 9**	
Introduction: Definition: Process Management –Role of Process Management – Needs of Process Management in Data Science – Stages of Data Processing.			CO1
UNIT-II	**Data Processing**	**Periods: 9**	
Data Processing: Process Architecture - Data Identification – Data Collection – Data Process – Data Extraction – Data Storage.			CO2
UNIT-III	**Modelling**	**Periods: 9**	
Modelling: Data Design – Data Development – Data Model – Types – Embedded Data Model – Normalized Data Model - Benefits – Application of Data Modelling and Use Case – Limitations.			CO3
UNIT-IV	**Evaluation and Deployment**	**Periods: 9**	
Evaluation and Deployment: Validation, Evaluation and Deployment – Cost Evaluation – Product Evaluation.			CO4
UNIT-V	**Case Studies**	**Periods: 9**	
Case Study: Hospitality – E-Commerce – Health Care – Entertainment - Consumer Segmentation.			CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 60

Text Books

1. Nadja Damij, Talib Damij, Process Management: A Multi-disciplinary Guide to theory, Modeling and Methodology-2020
2. Marlon Dumas, Marcello La Rosa, Jan Mendling, Hajo A. Reijers, Fundamentals of Business Process Management - 1 February 2019

Reference Books

1. John Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, Fourth Edition (March 14, 2020)

* TE – Theory Exam, LE – Lab Exam

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**	Programme: **B.Sc DATA SCIENCE AND ANALYTICS**						
Semester	**Sixth Semester**	Course Category Code: DSE			*End Semester Exam Type: **TE**			
Course Code	**A20DAE611**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Software Engineering**	3	0	0	3	25	75	100
Prerequisite	Basic knowledge in Software Engineering							

Course Objectives	- To understand the Software cycle. - To understand software project. - To Ability to translate end-user requirements into system. - To implement design and testing - To understand risk management of project.

Course Outcome	*After the completion of this course, the students will be able to:*		BT Mapping (Highest Level)
	CO1	The aim of the course is to provide an understanding of the working knowledge of the techniques.	**K2**
	CO2	Topics include process models, software requirements, software design, software testing, software process/product metrics	**K3**
	CO3	Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).	**K3**
	CO4	Identify and apply appropriate software architectures and patterns	**K4**
	CO5	To have experience and/or awareness of testing problems and will be able to develop a simple testing report	**K4**

UNIT-I	**INTRODUCTION TO SOFTWARE ENGINEERING**	**Periods: 09**
The evolving role of software, changing nature of software, software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). Process models: The waterfall model, Spiral model and Agile methodology		CO1

UNIT-II	**SOFTWARE REQUIREMENTS**	**Periods: 09**
Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.		CO2

UNIT-III	**DESIGN ENGINEERING**	**Periods: 09**
Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.		CO3

UNIT-IV	**TESTING STRATEGIES**	**Periods: 09**
A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Metrics for Process and Products: Software measurement, metrics for software quality.		CO4

UNIT-V	**RISK MANAGEMENT**	**Periods: 09**

Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards	CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

Reference Books

1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

Web References

1. https://www.computer.org/
2. https://www.pmi.org/
3. https://www.istqb.org/

* TE – Theory Exam, LE – Lab Exam

Evaluation Method

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* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**	Programme: B.Sc Data science and Analytics						
Semester	**Sixth Semester**	Course Category Code: **DSE**				*End Semester Exam Type: **TE**		
Course Code	**A20DAE612**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Introduction to Digital Technologies**	3	0	0	3	25	75	100
Prerequisite	Basic knowledge in Emerging Technologies							

Course Outcome		*After completion of the course, the students will be able to*				BT Mapping (Highest Level)
	CO1	Learn about digital Paradigm.				**K2**
	CO2	Understand the importance of digital technology, digital financial tools, and e- commerce.				**K2**
	CO3	Analyse the concepts of Communication and networks.				**K3**
	CO4	Understand the e- governance and Digital India Initiatives.				**K4**

UNIT-I	**INTRODUCTION**	**Periods: 09**	
Introduction & Evolution of Digital Systems. Role & Significance of Digital Technology & Tools. Computer System & it's working, Software and its types. Operating Systems: Types and Functions. Problem Solving: Algorithms and Flowcharts.			**CO1**
UNIT-II	**Communication Systems**	**Periods: 09**	
Communication Systems: Principles, Model & transmission Media. Computer Networks & Internet: Concepts & Applications, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking. Computer Based Information System: Significance & Types. E-Commerce & Digital Marketing: Basic Concepts, Benefits & Challenges.			**CO2**
UNIT-III	**Digital India & E – Governance**	**Periods: 09**	
Digital India & e – Governance: Initiatives, Infrastructure, Services and Empowerment. Digital Financial Tools : Unified Payment Interface , Aadhar Enabled payment System , USSD , Credit / Debit Cards , e-Wallets , Internet Banking , NEFT/RTGS and IMPS , Online Bill Payments and PoS . Cyber Security: Threats, Significance, Challenges, Precautions, Safety Measures & Tools, legal and ethical perspectives.			**CO3**
UNIT-IV	**Emerging Technologies & their applications**	**Periods: 09**	
Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, Internet of Things, and Virtual Reality.			**CO4**
UNIT-V	**Machine Learning & Artificial Intelligence**	**Periods: 09**	
Emerging Technologies & their applications: Block chain & Cryptocurrency, Robotics, Machine Learning & Artificial Intelligence, 3 – D Printing, Digital Signatures.			**CO5**

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Pramod Kumar , Anuradha Tomar, R. Sharmia , " Emerging Technologies in Computing – Theory , Practice , and Advances" , Chapman and Hall / CRC , 1st Edition , 2021 , eBook ISBN : 9781003121466
2. V. Raja Raman, "Introduction to Information Technology", PHI, 3rd Edition, 2018, ISBN – 10: 9387472299, ISBN- 13: 978-9387472297.

Reference Books

1. (https://doi.org/10.1201/9781003121466.
2.(https://www.khanacademy.org/computing)
3. (https://developer.mozilla.org/en-US/):

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10	5	5	5	75	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Computational Studies**	Programme: **B.Sc Data Science and Analytics**						
Semester	**Sixth Semester**	Course Category Code: **DSC**			*End Semester Exam Type: **LE**			
Course Code	**A20DAP602**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Project work and Viva-voce**	**0**	**0**	**10**	**5**	**50**	**50**	**100**

Domains:

- Web Services
- Networks
- Mobile Applications
- Artificial Intelligences
- Machine Learning
- Big Data

SI.NO	Description			Weightage
1	Continuous Assessment Marks			
a.	Review 1	Review Committee	5	10
		Guide	5	
b.	Review 2	Review Committee	10	20
		Guide	10	
c.	Review 3	Review Committee	10	20
		Guide	10	
		Total CAM		50
2	End Semester Marks			
a.	Evaluation of Mini Project report	External Examiner	40	40
b.	Outcome	Publication of Papers/ Conference Presentations/ Patents/ Prototypes etc.	10	10
		Total ESM		50
		Total Marks		100

Department	Computational Studies	Programme: B.Sc Data Science and Analytics						
Semester	Sixth Semester	Course Category Code: SEC				*End Semester Exam Type: TE		
Course Code	A20DAS606	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Research Methodology	4	0	0	2	100	-	100
Prerequisite	Basic Knowledge in Research Methodology							

Course Outcome		After the completion of this course, the students will be able to:	BT Mapping (Highest Level)
	CO1	Explain the basic aspects of research and its ethics	K2
	CO2	Outline research problems, their types and objectives	K3
	CO3	Formulate good research designs and carry out statistically relevant sampling	K3
	CO4	Collect, collate, analyse and interpret data systematically	K4
	CO5	Make use of literature and other search engines judiciously for research purposes	K4

UNIT-I	Introduction and Foundation of Research	Periods: 6

Meaning, Objectives, Motivation, Utility for research. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method –Understanding the language of research	CO1

UNIT-II	Problem identification and formulation	Periods: 6

Scientific Research: Problem, Definition, Objectives, Types, Purposes and components of Research problem	CO2

UNIT-III	Research Design	Periods: 6

Concept and Importance in Research : Features of a good research design, Exploratory Research Design and Descriptive Research Designs	CO3

UNIT-IV	Sampling	Periods: 6

Sampling methods, Merits and Demerits. Observation methods, Sampling Errors (Type I and Type II). Determining size of the sample. Experimental Design: Concept of Independent & Dependent variables	CO4

UNIT-V	Data analysis and Reporting	Periods: 6

Fundamentals of Statistical Analysis and Inference, Multivariate methods, Concepts of Correlation and Regression; Research Reports: Structure, Components, Types and Layout of Research report and articles, Writing and interpreting research results, Figures and Graphs	CO5

Lecture Periods: 30	Tutorial Periods: -	Practical Periods: -	Total Periods: 30

Text Books

1. Catherine Dawson, Introduction to research methods : a practical guide for anyone undertaking a research project, Oxford : How To Books, Reprint 2010

2. Julius S. Bendat, Allan G. Piersol, Random Data: Analysis and Measurement Procedures, 4 th Edition, ISBN: 978-1-118-21082-6, 640 pages, September 2011

Reference Books

1. John Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, Fourth Edition (March 14, 2013)

* TE – Theory Exam, LE – Lab Exam

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Record	Assignment*	Attendance		
Marks	50		20	20	10	-	100

* Application oriented / Problem solving / Design / Analytical in content beyond the syllabus