Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Semester-V

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject:** Signal Processing & Signal Processing Lab	
Course Code: BITDS501 & BITDS591	**Semester: V**
Duration: 36 Hrs.	**Maximum Marks: 100+100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical:4 hrs./week	Continuous Assessment:25
Credit: 3+2	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60

Aim:	
Sl. No.	
1.	**To introduce the student to frequency domain analysis of signals**

Objective: At the end of this course, students will demonstrate the ability to	
Sl. No.	
1.	**Represent signals mathematically in continuous and discrete-time, and in the frequency domain.**
2.	**Analyse discrete-time systems using z-transform**
3.	**Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.**
4.	**Design digital filters for various applications**.

Pre-Requisite:	
Sl. No.	
1.	**Knowledge on Calculus and trigonometry**
2.	**Programming knowledge**

Department of Information Technology (In-house)

Syllabus of B.Sc. in Information Technology (Data Science)

(Effective from academic session 2019-20)

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Energy and power signals, continuous and discrete-time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Linear shift-invariant (LSI) systems, impulse response, and step response, convolution, input-output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.	**8**	**10**
02	Periodic and semi-periodic inputs to an LSI system, the notion of frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect on the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.The idea of signal space and orthogonal bases.	**8**	**20**
03	The Laplace Transform, the notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.	**6**	**15**
04	The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.	**6**	**15**
05	State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. The relation between continuous and discrete time systems.	**8**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**

	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills: Upon successful completion of the course, student should be able to

Design and implement digital filters by hand

Use computers to create, analyze and process signals, and to simulate and analyze systems sound and image synthesis and analysis, to plot and interpret magnitude and phase of LTI system frequency responses.

List of Practical: Hands-on experiments related to the course contents

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
. A.V. Oppenheim, A.S. Willsky and I.T. Young	Signals and Systems		Prentice Hall
. R.F. Ziemer, W.H. Tranter and D.R. Fannin	Signals and Systems - Continuous and Discrete	4th edition	Prentice Hall
Reference Books:			
Papoulis	Circuits and Systems: A Modern Approach		HRW
B.P. Lathi	Signal Processing and Linear Systems		Oxford University Press
List of equipment/apparatus for laboratory experiments:			
Sl. No.			

1.	**Computer with moderate configuration**
2.	**Python / Matlab**

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				**60**
B	**1 to 5**			**5**	**3**	**5**	
C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-		
Signed Lab Note Book	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject:** Translational Bioinformatics & Translational Bioinformatics Lab			
Course Code: BITDS502A & BITDS592A		**Semester: V**	
Duration: 36 Hrs.		**Maximum Marks: 100+100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 0		Attendance : 5	
Practical:4 hrs./week		Continuous Assessment:25	
Credit: 3+2		Practical Sessional internal continuous evaluation:40	
		Practical Sessional external examination:60	
Aim:			
Sl. No.			
1.	To provide an elementary knowledge in Bioinformatics and Biological Information on the web.		
Objective:			
Sl. No.			
1.	To enable the students to understand scope of Bioinformatics		
2.	Understanding of popular bioinformatics database		
3.	Learn Fundamentals of Databases and Sequence alignment		
4.	Approaches to drug discovery using bioinformatics techniques		
Pre-Requisite:			
Sl. No.			
1.	Programming Knowledge(such as C)		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**

01	**Introduction to bioinformatics** Biological databases, with main focus on DNA and protein sequences Comparison and alignment of sequences, similarity-based searches in databases Discovery of protein sequence motifs and sequence features; metabolic pathway data Genome browsers and sources of gene expression data; gene lists and the concept of enrichment Micro-RNAs and their targets; protein visualization	**8**	**10**
02	**Phylogenetics** Introduction to phylogenetics, and essentials of evolution as background Data types for phylogenetic analysis and parsimony Distance based methods, distance matrices, nucleotide substitution models Model based methods: maximum likelihood and Bayesian phylogenetics Auxiliary methods: bootstrapping, consensus trees, tree comparison Visualization of phylogenetic trees	**8**	**20**
03	**Structural bioinformatics** Basics of protein structures and structure determination. Simple validation of models by Ramachandran plots. Basic use of molecular graphics software. Molecular graphics: illustrating and highlighting molecular details on screen and print; generating molecular surfaces. Comparison of structures: overlaying molecules and measuring their structural similarity Molecular animations Theory of protein modeling and protein dynamics Validation and analysis of models and project work.	**6**	**15**

04	**Biological data analysis with R** Introduction to R: Installation, package management, basic operations Sequences and sequence analysis Annotating gene groups: Ontologies, pathways, enrichment analysis Proteomics: mass spectometry Reconstructing gene regulation networks Network analysis: iGraph	**6**	**10**
05	**High-throughput data analysis with R** Flow cytometry: counting and sorting stained cells Next-generation sequencing: introduction and genomic applications Quantitative transcriptomics: qRT-PCR Advanced transcriptomics: gene expression microarrays Next-generation sequencing in transcriptomics: RNA-seq experiments Analysis of transcription factor binding	**8**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**
Practical: **Skills to be developed:** Intellectual skills: Students will be able to:			

Explore bioinformatics from computing perspective.

Apply data mining techniques to provide better health care services.

Explore and extract hidden information from bio informatics databases.

List of Practical: Hands-on experiments related to the course contents

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Robert Gentleman	R Programming for Bioinformatics		CRC Press

Reference Books:

Arthur M. Lesk	Introduction to bioinformatics	978-0199651566	Oxford University Press
Sunil Mathur	Statistical Bioinformatics with R	9780123751041	Elesevier

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	**Computer**

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	Unit	Objective Questions (MCQ only with the	Subjective Questions

		correct answer)					
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 7**	**10**	**10**				**60**
B	**1 to 7**			**5**	**3**	**5**	
C	**1 to 7**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Note Book	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject:** Cloud Computing & Cloud Computing Lab	
Course Code: BITDS502B & BITDS592B	**Semester: V**
Duration: 36 Hrs.	**Maximum Marks: 100+100**
Teaching Scheme	**Examination Scheme**
Theory: 3hrs./week	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical:4 hrs./week	Continuous Assessment:25
Credit: 3+2	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60

Aim: The main aim of this subject to enhance student knowledge with following concept

Sl. No.	
1.	Core concepts of the cloud computing
2.	Concepts in cloud infrastructures
3.	Concepts of cloud storage
4.	Cloud programming models

Objective:

Sl. No.	
1.	To learn how to use Cloud Services.
2.	To implement Virtualization
3.	To implement Task Scheduling algorithms.
4.	Understand the impact of engineering on legal and societal issues involved and different security aspect.

Pre-Requisite:

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Sl. No.			
1.	Knowledge of computer systems, programming and debugging, with a strong competency in at least one language (such as Java/Python), and the ability to pick up other languages as needed.		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Definition of Cloud Computing and its Basics** Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service Platform as a Service, Software as a Service with examples of services/ service providers, models – Infrastructure as a Service, Cloud Reference model, Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing, A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients, IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)	**6**	**15**
02	**Use of Platforms in Cloud Computing** Concepts of Abstraction and Virtualization Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and	**14**	**20**

	AppZero Virtual Application appliance,Concepts of Platform as a Service, Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks, Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service., Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service, Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services,		
03	**Cloud Infrastructure** Cloud Management: An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle). Concepts of Cloud Security: Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)	**8**	**20**
04	**Concepts of Services and Applications** Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven	**8**	**15**

	SOA, Enterprise Service Bus, Service catalogs, Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs Cloud-based Storage: Cloud storage definition – Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services		
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Students are able to develop different algorithms related to Cloud Computing.
2. Students are able to assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application.
3.

List of Practical: Hands-on experiments related to the course contents

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Barrie Sosinsky	Cloud Computing Bible	2013	Wiley India Pvt. Ltd
Rajkumar Buyya ,Christian Vecchiola, S.	Mastering Cloud Computing	2013	McGraw Hill Education (India) Private Limited

Thamarai Selvi			
Reference Books:			
Anthony T. Velte	Cloud computing: A practical approach		Tata Mcgraw-Hill
Dr. Kumar Saurabh	Cloud Computing		Wiley India
Moyer	Building applications in cloud:Concept, Patterns and Projects		Pearson
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
1.	**Computer with moderate configuration with high speed internet connection**		
2.	**Python , java,**		

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 4**	**10**	**10**				**60**
B	**1 to 4**			**5**	**3**	**5**	
C	**1 to 4**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions

should be given on top of the question paper.				
Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				
Continuous evaluation				**40**
External Examination: Examiner-				
Signed Lab Note Book			**10**	
On Spot Experiment			**40**	
Viva voce			**10**	**60**

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject:** Predictive & Prognostic Analytics & Predictive & Prognostic Analytics lab	
Course Code: BITDS502C & BITDS592C	**Semester: V**
Duration: 36 Hrs	**Maximum Marks: 100+100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical:4 hrs./week	Continuous Assessment:25
Credit: 3+2	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60

Aim:

Sl. No.	
1.	Understand the process of formulating business objectives, data selection/collection, preparation and process to successfully design, build, evaluate and implement predictive models for a various business application.
2.	Compare the underlying predictive modeling techniques.
3.	Select appropriate predictive modeling approaches to identify cases to progress with.
4.	Apply predictive modeling approaches using a suitable package such as SPSS Modeler

Objective:

Sl. No.	
1.	To learn, how to develop models to predict categorical and continuous outcomes, using such techniques as neural networks, decision trees, logistic regression, support vector machines and Bayesian network models.
2.	To know the use of the binary classifier and numeric predictor nodes to automate model selection.
3.	To advice on when and how to use each model. Also learn how to combine two or more models to improve prediction

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Pre-Requisite:			
Sl. No.			
1.	**Analytical skill**		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction to Data Mining Introduction, what is Data Mining? Concepts of Data mining, Technologies Used, Data Mining Process, KDD Process Model, CRISP – DM, Mining on various kinds of data, Applications of Data Mining, Challenges of Data Mining.	**8**	**10**
02	Data Understanding and Preparation Introduction, Reading data from various sources, Data visualization, Distributions and summary statistics, Relationships among variables, Extent of Missing Data. Segmentation, Outlier detection, Automated Data Preparation, Combining data files, Aggregate Data, Duplicate Removal, Sampling DATA, Data Caching, Partitioning data, Missing Values.	**8**	**20**
03	Model development & techniques Data Partitioning, Model selection, Model Development Techniques, Neural networks, Decision trees, Logistic regression, Discriminant analysis, Support vector machine, Bayesian Networks, Linear Regression, Cox Regression, Association rules.	**10**	**20**
04	Model Evaluation and Deployment Introduction, Model Validation, Rule Induction Using CHAID, Automating Models for Categorical and Continuous targets, Comparing and Combining Models, Evaluation Charts for Model Comparison, MetaLevel Modeling, Deploying Model, Assessing Model Performance, Updating a Model.	**10**	**20**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**
Practical: **Skills to be developed:**			

Intellectual skills:

1. Can identify a solution for the problem.
2. Can implement the plan .
3. Can monitor the solution.

List of Practical: Hands-on experiments related to the course contents

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
	Predictive & Advanced Analytics		IBM

Reference Books:

Eric Siegel	Predictive Analytics		

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer
2.	Software R/Python

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 4**	**10**					

B **C**	**1 to 4** **1 to 4**		**10**	**5** **5**	**3** **3**	**5** **15**	**60**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Note Book	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject:** Information and Coding Theory	
Course Code: BITDS503	**Semester: V**
Duration: 48 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	End Semester Exam: 70
Tutorial: 1 hr./week	Attendance : 5
Practical:0	Continuous Assessment:25
Credit: 4	Practical Sessional internal continuous evaluation:NA
	Practical Sessional external examination:NA

Aim:	
Sl. No.	
1.	The aim of this course is to provide a basic understanding of the nature of information, the effects of noise in analogue and digital transmission systems and the construction of both source codes and error-detection/-correction codes.

Objective:	
Sl. No.	
1	To equip students with the basic understanding of the fundamental concept of source coding, error correction and information as they are used in communications.
2	To enhance knowledge of probabilities, entropy and measures of information.
3	To guide the student through the implications and consequences of information theory and coding theory with reference to the application in modern communication and computer systems.

Pre-Requisite:	
Sl. No.	
1	Strong mathematical knowledge on probability and abstract algebra.

2	And the ability to understand new mathematical concepts as needed.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Source Coding:** Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.	**7**	**10**
02	**Channel Capacity And Coding:** Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.	**12**	**20**
03	**Linear And Block Codes For Error Correction:** Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes.	**12**	**20**
04	**Cyclic Codes:** Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes. BCH Codes Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes.	**7**	**10**
05	**Convolutional Codes** Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.	**10**	**10**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**

	Total:	**52**	**100**

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Ranjan Bose	Information theory, coding and cryptography		TMH
N Abramson	Information and Coding		McGraw Hil
Reference Books:			
M Mansurpur	Introduction to Information Theory		McGraw Hill
R B Ash	Information Theory		Prentice Hall.

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 5**	**10**	**10**				**60**
B	**1 to 5**			**5**	**3**	**5**	

C	**1 to 5**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject:** Optimisation Techniques in Data Analysis			
Course Code: BITDS504		**Semester: V**	
Duration: 48 Hrs.		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 1 hr./week		Attendance : 5	
Practical:0		Continuous Assessment:25	
Credit: 4		Practical Sessional internal continuous evaluation:NA	
		Practical Sessional external examination:NA	
Aim:			
Sl. No.			
1.	The aim of this course is to provide a basic understanding of the Optimisation Techniques		
Objective:			
Sl. No.			
1	To impart knowledge in concepts and tools of Operations Research		
2	To understand mathematical models used in Operations Research		
3	To apply these techniques constructively to make effective business decisions		
Pre-Requisite:			
Sl. No.			
1	Strong mathematical background.		
2	And the ability to understand new mathematical concept as needed.		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**

01	**Introduction to Operation Research:** Operation Research approach, scientific methods, introduction to models and modeling techniques, general methods for Operation Research models, methodology and advantages of Operation Research, history of Operation Research.	**3**	**5**
02	**Linear Programming (LP):** Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.	**8**	**10**
03	**Transportation & Assignment Problems:** Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems.	**7**	**10**
04	**Network Analysis:** Network definition and Network diagram, probability in PERT analysis, project time cost trade off, introduction to resource smoothing and allocation.	**7**	**10**
05	**Sequencing:** Introduction, processing N jobs through two machines, processing N jobs through three machines, processing N jobs through m machines.	**4**	**5**
06	**Inventory Model:** Introduction to inventory control, deterministic inventory model, EOQ model with quantity discount.	**4**	**5**
07	**Queuing Models:** Concepts relating to queuing systems, basic elements of queuing model, role of Poison & exponential distribution, concepts of birth and death process.	**7**	**10**
08	**Replacement & Maintenance Models:** Replacement of items, subject to deterioration of items subject to random failure group vs. individual replacement policies.	**4**	**5**
09	**Simulation:** Introduction & steps of simulation method, distribution functions and random number generation.	**4**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**

	Total:	**40**	**100**

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
J K Sharma	Operations Research Theory and Applications		MacMillan India Ltd
N D Vohra	Quantitative Techniques in management		Tata McGraw Hill
Reference Books:			
Handy A Taha	Operations Research – An Introduction		Prentice Hall of India, New Delhi.
Wagner H M	Principles of Operations Research: With Applications to Management Decisions		Prentice-Hall of India, New Delhi.
Hillier F S and Lieberman G J	Operations Research		Holden Day Inc., San Francisco
Payne T A	Quantitative Techniques for Management: A Practical Approach		Reston Publishing Co. Inc., Virginia.

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	Unit	Objective Questions (MCQ only with the correct answer)	Subjective Questions

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 9**	**10**	**10**				**60**
B	**1 to 9**			**5**	**3**	**5**	
C	**1 to 9**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**3**	**3**

Department of Information Technology (In-house)
Syllabus of B.Sc. in Information Technology (Data Science)
(Effective from academic session 2019-20)

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject:** Major Project -I	
Course Code: BITDS581	**Semester: V**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 4 hrs./week	**Continuous Assessment: 0**
Credit: 2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60
Contents	
Students will do projects on application areas of latest technologies and current topics of societal relevance.	

Name of the Course: B.Sc. in Information Technology (Data Science) **Subject: Industrial Training and Presentation**	
Course Code: BITDS582	**Semester: V**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 0	**End Semester Exam: 100**
Tutorial: 0	**Attendance: 0**
Practical: 4 hrs./week	**Continuous Assessment: 0**
Credit: 2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60
Contents	
Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.	