| | |
|---|---|
| **Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)**<br>**Subject:** Big Data Analytics and Big Data Analytics Lab | |
| **Course Code: BITAI 601 & BITAI 691** | **Semester: VI** |
| **Duration: 36** | **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 Big Data Platform and its Use cases |
| 2. | Provide an overview of Apache Hadoop |
| 3. | Provide HDFS Concepts and Interfacing with HDFS |
| 4. | Understand Map Reduce Jobs |
| 5. | Provide hands on Hodoop Eco System |
| 6. | Apply analytics on Structured, Unstructured Data. |
| | |

**Objective:**

| Sl. No. | The students will be able to: |
|---|---|
| 1. | Identify Big Data and its Business Implications. |
| 2. | List the components of Hadoop and Hadoop Ecosystem |
| 3. | Access and Process Data on Distributed File System |
| 4. | Manage Job Execution in Hadoop Environment |
| 5. | Develop Big Data Solutions using HadoopEcoSystem |
| 6. | AnalyzeInfosphereBigInsights Big Data Recommendations. |
| | |

**Pre-Requisite:**

| Sl. No. | |
|---|---|
| 1. | |
| 2. | |
| 3. | |

| **Contents** | | **Hrs./week** | |
|---|---|---|---|
| **Chapter** | **Name of the Topic** | **Hours** | **Marks** |
| 01 | **INTRODUCTION TO BIG DATA AND HADOOP**<br><br>Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to InfosphereBigInsights and Big Sheets. | **8** | **15** |
| 02 | | **10** | **20** |

| | | | |
|---|---|---|---|
| | **HDFS(Hadoop Distributed File System)**<br><br>The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. | | |
| 03 | **Map Reduce**<br><br>Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features. | **8** | **15** |
| 04 | **Hadoop Eco System Pig :**<br><br>Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase :HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. | **10** | **20** |
| | **Sub Total:** | **36** | **70** |
| | **Internal Assessment Examination & Preparation of Semester Examination** | **4** | **30** |
| | **Total:** | **40** | **100** |

**Practical:**

**Course Code:**BITAI691

**Credit: 2**

**List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)**

**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 |
|---|---|---|---|
| Tom White | Hadoop: The Definitive Guide | 3rd | O'reily Media, |
| Seema Acharya, SubhasiniChellappan, | Big Data Analytics | | Wiley |
| **Reference Books:** | | | |
| Michael Berthold, David J. Hand | Intelligent Data Analysis | | Springer |
| Jay Liebowitz, | Big Data and Business Analytics | | Auerbach Publications, CRC press |
| AnandRajaraman and Jefrey David Ulman, | Mining of Massive Datasets | | Cambridge University Press |
| Bill Franks, | Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with | | John Wiley & sons |

| | | | |
|---|---|---|---|
| | Advanced Analytics | | |
| Tom Plunkett, Mark Hornick | Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop | | McGraw-Hill/Osborne Media (2013), Oracle press |
| | | | |

**List of equipment/apparatus for laboratory experiments:**

| Sl. No. | |
|---|---|
| 1. | **Computer** |
| 2. | **Linux/Ubantu operating system** |
| 3. | **Oracle/ 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** | **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** |

| | |
|---|---|
| **Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)**<br>**Subject:** Cloud Computing and Cloud Computing Lab | |
| **Course Code: BITAI 602& BITAI 692** | **Semester: VI** |
| **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. | Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures. |
| 2. | Design different workflows according to requirements and apply map reduce programming model. |
| 3. | Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms. |
| 4. | Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds |
| 5. | Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application |
| 6. | Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing. |
| | |

**Objective:**

| Sl. No. | |
|---|---|
| 1. | To learn how to use Cloud Services. |
| 2. | To implement Virtualization |
| 3. | To implement Task Scheduling algorithms. |
| 4. | Apply Map-Reduce concept to applications. |
| 5. | To build Private Cloud. |
| 6. | Broadly educate to know the impact of engineering on legal and societal issues involved. |

**Pre-Requisite:**

| Sl. No. | |
|---|---|
| 1. | Knowledge on Operating System. |
| 2. | Knowledge on Virtualization. |
| 3. | Knowledge on Networking. |
| | |

| Contents | | Hrs./week | |
|---|---|---|---|
| **Chapter** | **Name of the Topic** | **Hours** | **Marks** |
| 01 | **Definition of Cloud Computing and its Basics**<br><br>1. Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , | **9** | **20** |

| | | | |
|---|---|---|---|
| | Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing 2. Cloud Architecture: A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients 3. Services and Applications by Type 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) | | |
| 02 | **Use of Platforms in Cloud Computing**<br><br>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 AppZero Virtual Application appliance 2. 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 3. Use of Google Web Services 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. 4. Use of Amazon Web Services Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service Syllabus for B.Tech(Information Technology) Up to Fourth Year Revised Syllabus of B.Tech IT (for the students who were admitted in Academic Session 2010-2011) 55 5. Use of Microsoft Cloud Services Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services | **12** | **25** |
| 03 | **Cloud Infrastructure**<br><br>Types of services required in implementation – Consulting, Configuration, Customization and Support 1. Cloud Management An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring | **7** | **10** |

| | | | |
|---|---|---|---|
| | of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle) 2. 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) | | |
| 04 | **Concepts of Services and Applications**<br><br>Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs 2. Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs 3. Cloud-based Storage: Cloud storage definition – Manned and Unmanned 4. Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services | **8** | **15** |
| | **Sub Total:** | **36** | **70** |
| | **Internal Assessment Examination & Preparation of Semester Examination** | **4** | **30** |
| | **Total:** | **40** | **100** |

**Practical:**

**Course Code:**BITAI692

**Credit: 2**

**List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)**

**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 | | Wiley India Pvt. Ltd |
| RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, | Mastering Cloud Computing | | McGraw Hill Education (India) Private Limited |
| Anthony T. Velte, | Cloud computing: A practical approach | | Tata Mcgraw-Hill. |
| | | | |

**Reference Books:**

| | | | |
|---|---|---|---|
| | | | |
| Dr. Kumar Saurabh, | Cloud Computing | Second Edition | Wiley India |
| | | | |
| | | | |

**List of equipment/apparatus for laboratory experiments:**

| Sl. No. | |
|---|---|
| 1. | **Computer** |
| 2. | **Linux/Ubantu operating system** |

| **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** |

| | |
|---|---|
| **Name of the Course: B.Sc. in Information Technology (AI)**<br>**Subject:** Deep Learning | |
| **Course Code:** BITAI 603A | **Semester: VI** |
| **Duration: 36 Hrs.** | **Maximum Marks: 100** |
| **Teaching Scheme** | **Examination Scheme** |
| **Theory: 3 hrs./week** | End Semester Exam: 70 |
| **Tutorial: 0** | Attendance : 5 |
| **Practical: 0** | Continuous Assessment:25 |
| **Credit: 3** | Practical Sessional internal continuous evaluation:NA |
| | Practical Sessional external examination:NA |

**Aim:**

| Sl. No. | |
|---|---|
| 1. | **Deep Learning**" is to introduce students to state-of-the-art methods and modern programming tools for data analysis |
| | |

**Objective:**

| Sl. No. | After completing the course, the student are expected to: |
|---|---|
| 1. | understand complexity of Machine Learning algorithms and their limitations |
| 2. | understand modern notions in data analysis oriented computing |
| 3. | be capable of confidently applying common Machine Learning algorithms in practice and implementing their own |
| 4. | be capable of performing distributed computations |
| 5. | be capable of performing experiments in Machine Learning using real-world data. |

**Pre-Requisite:**

| Sl. No. | |
|---|---|
| 1. | Calculus, Linear Algebra |
| 2. | Probability & Statistics |
| 3. | Ability to code in R/Python |

| **Contents** | | **Hrs./week** | |
|---|---|---|---|
| **Chapter** | **Name of the Topic** | **Hours** | **Marks** |
| 01 | What is deep learning? DL successes, Gradient descent, logistic regressi**on.** | **4** | **8** |
| 02 | Probability, continuous and discrete distributions; maximum likelihood. | **4** | **8** |
| 03 | Cost functions, hypotheses and tasks; training data; maximum likelihood based cost, cross entropy, MSE cost; feed-forward networks; MLP, sigmoid units; neuroscience inspiration | **6** | **12** |
| 04 | **O**utput vs hidden layers; linear vs nonlinear networks;learning via gradient descent; recursive chain rule (backpropagation); if time: bias-variance tradeoff, regularization; output units: linear, softmax; hidden units: tanh, RELU; . Deep learning strategies | **6** | **12** |
| 05 | How to use the SCC cluster; introduction to Tensorflow. Please bring your laptop to class, this will be an interactive tutorial. | **6** | **10** |

| | | | |
|---|---|---|---|
| 06 | Convolutional neural networks ,probabilistic methods ,Recurrent neural networks | **4** | **8** |
| 07 | Unsupervised deep learning (autoencoders ),. deep generative models | **4** | **8** |
| 08 | Deep reinforcement learning, NLP | **2** | **4** |
| | **Sub Total:** | **36** | **70** |
| | **Internal Assessment Examination & Preparation of Semester Examination** | **4** | **30** |
| | **Total:** | **40** | **100** |

**List of Books**
**Text Books:**

| Name of Author | Title of the Book | Edition/ISSN/ISBN | Name of the Publisher |
|---|---|---|---|
| Goodfellow, I.,Bengio,Y., and Courville A., | Deep Learning | | MIT Press |
| Satish Kumar | Neural Networks: A Classroom Approach | | Tata McGraw-Hill |

**Reference Books:**

| | | | |
|---|---|---|---|
| Bishop, C. ,M. | Pattern Recognition and Machine Learning | | Springer |
| Yegnanarayana, B. | Artificial Neural Networks | | PHI Learning Pvt. Ltd |
| Golub, G.,H., and Van Loan,C.,F. | Matrix Computations | | JHU Press |

**List of equipment/apparatus for laboratory experiments:**

| | |
|---|---|
| | |

**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 8** | **10** | **10** | | | | **60** |
| **B** | **1 to 8** | | | **5** | **3** | **5** | |
| **C** | **1 to 8** | | | **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** |

| | |
|---|---|
| **Name of the Course: B.Sc. in Information Technology (AI)**<br>**Subject:** Intrusion Detection and Prevention | |
| **Course Code: BITAI603B** | **Semester: VI** |
| **Duration: 36 Hrs.** | **Maximum Marks: 100** |
| **Teaching Scheme** | **Examination Scheme** |
| **Theory: 3 hrs./week** | **End Semester Exam: 70** |
| **Tutorial:** | **Attendance : 5** |
| **Practical: 0** | **Continuous Assessment: 25** |
| **Credit: 3** | **Practical Sessional internal continuous evaluation: NA** |
| | **Practical Sessional external examination: NA** |

| **Aim:** | |
|---|---|
| **Sl. No.** | |
| 1. | Compare alternative tools and approaches for Intrusion Detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion. |
| 2. | Identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities all intrusion detection systems share. |
| | |

| **Objective:** | |
|---|---|
| **Sl. No.** | After completion of the course, students will be able to: |
| 1. | Possess a fundamental knowledge of Cyber Security. Understand what vulnerability is and how to address most common vulnerabilities. |
| 2. | Know basic and fundamental risk management principles as it relates to Cyber Security and Mobile Computing. Have the knowledge needed to practice safer computing and safeguard your information using Digital Forensics. |
| 3. | Understand basic technical controls in use today, such as firewalls and Intrusion Detection systems. Understand legal perspectives of Cyber Crimes and Cyber Security. |

| **Contents** | | **3 Hrs./week** | |
|---|---|---|---|
| **Chapter** | **Name of the Topic** | **Hours** | **Marks** |
| 01 | The state of threats against computers, and networked systems-Overview of computer security solutions and why they fail-Vulnerability assessment, firewalls, VPN's -Overview of Intrusion Detection and Intrusion Prevention, Network and Host-based IDS | **7** | **14** |
| 02 | Classes of attacks - Network layer: scans, denial of service, penetration Application layer: software exploits, code injection-Human layer: identity theft, root access-Classes of attackers-Kids/hackers/sop Hesitated groups-Automated: Drones, Worms, Viruses | **7** | **14** |
| 03 | A General IDS model and taxonomy, Signature-based Solutions, | **8** | **14** |

| | | | |
|---|---|---|---|
| | Snort, Snort rules, Evaluation of IDS, Cost sensitive IDS | | |
| 04 | Anomaly Detection Systems and Algorithms-Network Behaviour Based Anomaly Detectors (rate based)-Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, Payload Anomaly Detection R16 B.TECH IT | **7** | **14** |
| 05 | Attack trees and Correlation of alerts- Autopsy of Worms and Botnets-Malware detectionObfuscation, polymorphism- Document vectors. Email/IM security issues-Viruses/Spam-From signatures to thumbprints to zero-day detection-Insider Threat issues-Taxonomy-Masquerade and Impersonation Traitors, Decoys and Deception-Future: Collaborative Security | **7** | **14** |
| | **Sub Total:** | **36** | **70** |
| | **Internal Assessment Examination & Preparation of Semester Examination** | **4** | **30** |
| | **Total:** | **40** | **100** |

**List of Books**
**Text Books:**

| **Name of Author** | **Title of the Book** | **Edition/ISSN/ISBN** | **Name of the Publisher** |
|---|---|---|---|
| Peter Szor | The Art of Computer Virus Research and Defense, | ISBN 0-321-30545-3. | Symantec Press |
| Markus Jakobsson and ZulfikarRamzan, | Crimeware: Understanding New Attacks and Defenses | ISBN: 978-0321501950 | Symantec Press |
| **Reference Books:** | | | |
| Ali A. Ghorbani, Wei Lu | Network Intrusion Detection and Prevention: Concepts and Techniques | | Springer |
| Paul E. Proctor | The Practical Intrusion Detection Handbook | | Prentice Hall |
| AnkitFadia and MnuZacharia | Intrusiion Alert | | Vikas Publishing house Pvt |
| | | | |
| AnkitFadia, | Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection. | Second edition | Vikas Publication House Pvt Ltd |
| | | | |

| **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** | | | | |
| **B** | **1 to 5** | | | **5** | **3** | **5** | **60** |
| **C** | **1 to 5** | | | **5** | **3** | **15** | |

- Only multiple choice type questions (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** | **5** | **3** |

| | |
|---|---|
| **Name of the Course: B.Sc. in Information Technology (AI)**<br>**Subject:** Bioinformatics | |
| **Course Code: BITAI603C** | **Semester: 6th** |
| **Duration:** 36 Hrs. | **Maximum Marks: 100** |
| **Teaching Scheme** | **Examination Scheme** |
| **Theory: 3 hrs./week** | **End Semester Exam: 70** |
| **Tutorial: 0** | **Attendance : 5** |
| **Practical: 0** | **Continuous Assessment: 25** |
| **Credit: 3** | **Practical Sessional internal continuous evaluation: NA** |
| | **Practical Sessional external examination: NA** |

| **Aim:** | |
|---|---|
| **Sl. No.** | |
| 1. | To give students an introduction to the basic practical techniques of bioinformatics. Emphasis will be given to the application of bioinformatics and biological databases to problem solving in real research problems. |
| 2. | The students will become familiar with the use of a wide variety of internet applications, biological database and will be able to apply these methods to research problems. |
| | |

| **Objective:** | |
|---|---|
| **Sl. No.** | After completion of the course, students will be able to: |
| 1. | Describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches, and analyze and discuss the results in light of molecular biological knowledge |
| 2. | Explain the major steps in pairwise and multiple sequence alignment, explain the principle for, and execute pairwise sequence alignment by dynamic programming |
| 3. | Predict the secondary and tertiary structures of protein sequences. |

| **Contents** | | **3 Hrs./week** | |
|---|---|---|---|
| **Chapter** | **Name of the Topic** | **Hours** | **Marks** |
| 01 | Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles. Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept. Concepts of RNA : Basic structure, Difference between RNA and DNA. Types of RNA. Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Tranlation Introduction to Metabolic Pathways | **7** | **12** |
| 02 | Sequence Databases 2 Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. sequence database search programs like BLAST | **7** | **14** |

| | | | |
|---|---|---|---|
| | and FASTA. NCBI different modules: GenBank; OMIM, Taxonomy browser, PubMed; | | |
| 03 | DNA SEQUENCE ANALYSIS 14 Syllabus for B.Tech(Information Technology) Up to Fourth Year Revised Syllabus of B.Tech IT DNA Mapping and Assembly : Size of Human DNA ,Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules. DeBruijn Graph. Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignment, Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman. | **8** | **18** |
| 04 | Introduction Probabilistic models used in Computational Biology 8 Probabilistic Models; Hidden Markov Model : Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bioinformatics :Genefinding, profile searches, multiple sequence alignment and regulatory site identification. Bayesian networks Model :Architecture, Principle ,Application in Bioinformatics. | **7** | **12** |
| 05 | Biological Data Classification and Clustering 6 Assigning protein function and predicting splice sites: Decision Tree | **7** | **14** |
| | **Sub Total:** | **36** | **70** |
| | **Internal Assessment Examination & Preparation of Semester Examination** | **4** | **30** |
| | **Total:** | **40** | **100** |

**List of Books**
**Text Books:**

| **Name of Author** | **Title of the Book** | **Edition/ISSN/ISBN** | **Name of the Publisher** |
|---|---|---|---|
| Des Higgins (Editor), Willie Taylor. | Bioinformatics: Sequence, Structure and Databanks: A Practical Approach | ISBN: 978-0199637904. 1st edition, | Oxford University Press. |
| David W. Mount. | Bioinformatics: Sequence and Genome Analysis | ISBN: 978-0879697129 2nd edition, | Cold spring harbor laboratory press. |
| **Reference Books:** | | | |
| | | | |
| Teresa Attwood, David Parry-Smith | Introduction to Bioinformatics | ISBN: 978-8178085074 1st edition | Pearson Education. |
| Andreas D. Baxevanis, | Bioinformatics: A | ISBN: 978- | John Wiley & Sons, |

| | | | |
|---|---|---|---|
| B. F. Francis Ouellette. | Practical Guide to the Analysis of Genes and Proteins | 0471478782.<br><br>Second Edition, | Inc., Publication. |
| | | | |
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| | | | |

**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**<br><br>**B**<br><br>**C** | **1 to 5**<br><br>**1 to 5**<br><br>**1 to 5** | **10** | **10** | <br><br>**5**<br><br>**5** | <br><br>**3**<br><br>**3** | <br><br>**5**<br><br>**15** | <br><br>**60** |

- Only multiple choice type questions (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** | **5** | **3** |

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| **Name of the Course: B.Sc. in Information Technology (AI)**<br>**Subject:** Grand Viva | |
| **Course Code:** BITAI 681 | **Semester: VI** |
| **Duration:** 36 Hrs. | **Maximum Marks: 100** |
| **Teaching Scheme** | **Examination Scheme** |
| **Theory: 0** | **End Semester Exam: 100** |
| **Tutorial: 0** | **Attendance: 0** |
| **Practical: 2 hrs./week** | **Continuous Assessment: 0** |
| **Credit: 1** | **Practical Sessional internal continuous evaluation: 0** |
| | **Practical Sessional external examination: 0** |
| **Contents** | |
| Students will give a viva from all the subject that they have covered in the course. | |

| | |
|---|---|
| **Name of the Course: B.Sc. in Information Technology (AI)**<br>**Subject:** Major Project II | |
| **Course Code:** BITCS 682 | **Semester: VI** |
| **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: 0** |
| | **Practical Sessional external examination: 0** |
| **Contents** | |
| Students will do projects on application areas of latest technologies and current topics of societal relevance | |