

Guru Nanak Dev Engineering College, Ludhiana  
 Department of Information Technology  
 M. Tech (IT) Scheme 2019  
 Semester 3  
**Subject Code:** MIT-119  
**Subject Name:** Health Informatics

<b>Programme:</b> M. Tech.	<b>L: 3 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 100	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 150	<b>Course Type:</b> Programme Elective-V

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. Understand the problems and challenges that health informatics addresses.
2. Introduce students to the research and practice of health informatics
3. Lead students in discussion around ethical and diversity issues in health informatics
4. Analysis and understanding the real case studies and examining the digital evidence related to health sciences.
5. Assess information and knowledge needs of health care professionals, patients and their families

**Prerequisites:** Programming Knowledge and basic data mining tools.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**Part- A**

**Health Informatics:**

Epidemiology and Biostatistics, Comparative Health Systems and International Health, Human Biology & Medical, Organization and Administration of Clinical & Support services, Global Week-International Healthcare Mgt Faculty, Quality in Healthcare, Health Economics, Health Mgt Information Systems, Health Insurance and Emerging Domains in Healthcare. [10 Hours]

**Health IT & Analytics Specialization:**

Introduction to Programming & Healthcare Databases, Healthcare Information Technology Standards and Interoperability, Clinical Healthcare Applications, Healthcare Information Technology Standards adoption across the globe, Healthcare Information Systems Analysis & Design, Healthcare Applications for Administrative Support & Customer Relationships, Telemedicine and Innovations in Healthcare Ecosystem, Project Management in Healthcare IT and Strategic Use of IT applications in Healthcare Industry.[10 Hours]

**Part-B**

**Public Health:**

Managing large scale public health programmes, Monitoring & Evaluation, Advance Research and Analysis skills, Total Quality Management-Tools & Techniques, International NGOs and

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their work in Public Health, Epidemiology and Biostatistics-Advanced, Health Economics & Health Financing-Advanced, Project Report writing, Public Health Management-Tools and Techniques and Public Health Legislations and Ethics.[8 Hours]

**Health informatics Standards:**

DICOM, PACS, EHR, Digital imaging, Telemedicine and Technological innovations in healthcare, HL7 Standards, HL7 Messaging, HMIS and CDSS, FHIR standards, Emergency Domains in Health healthcare, Healthcare software Engineering and System Analysis and Design Programming.[8 Hours]

**Health Information Policy and Security:**

Security Principles, Data Security in the Cloud, Security Breaches and Attacks, Health Informatics Ethics, Laws and Cultures as well as their International Considerations, Code of Individual Countries. Mobile Technology in Health Informatics, Online Medical Resources and their subscriptions, Patient Safety and Health Information Technology.[8 Hours]

**Text Books:**

1. Health Informatics – Practical Guide for Healthcare and Information Technology Professionals, Sixth Edition, Robert E. Hoyt, Ann K. Yoshihashi, Informatics Education.
2. Health Informatics – A Review, edited by Evelyn J. S. Hovenga, M. R. Kidd, Sebastian Garde, IOS Press, 2018.

**Reference Books:**

1. Book Cover of Charlotte A. Weaver, Marion J. Ball, George R. Kim, Joan M. Kiel - Healthcare Information Management Systems: Cases, Strategies, and Solutions (Health Informatics).
2. Healthcare Information Management Systems, Cases, Strategies, and Solutions, Charlotte A. Weaver, Marion J. Ball, George R. Kim, Joan M. Kiel, 2015

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**Subject Code: LMIT-119**

**Subject Name: Health Informatics Laboratory**

<b>Programme:</b> M. Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 50	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Programme Elective-V

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. Understand the process of data cleaning.
2. Apply data mining techniques on health care data
3. Design and prepare the documentation of health care application.
4. Design architecture and apply security policies on Health information application.
5. Apply testing and create final report.

**Prerequisites:** Programming Knowledge and basic data mining tools.

**Detailed Contents:**

1. Preparation of the health care dataset after collection of data and cleaning the data using various data cleaning techniques.
2. Implementation of Data Mining algorithms on health care data.
3. Preparation of Electronic Health Record database that will provide history, diagnosis and documentation of any patient in the database.
4. Design a Requirement Specification document for Healthcare Information System application.
5. Develop a design document describing the use cases and architecture of the healthcare information system application.
6. Implementation of various security and privacy policies on the Health care information application.
7. Developing, testing and demonstrating a working application, implementing the design document.
8. Creating a final report describing the application built.

**Mini Project:** - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required).

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Semester 3  
**Subject Code:** MIT-120  
**Subject Name:** Cloud Computing

<b>Programme:</b> M. Tech.	<b>L: 3 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 100	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 150	<b>Course Type:</b> Programme Elective-V

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. To assess existing hosting platforms and computing paradigms currently being used in industry and academia.
2. To comprehend need of data centre, its virtualization techniques and types of clouds.
3. To demonstrate the implementation of cloud by using commercial and open source cloud platforms and its virtualization.
4. To implement cloud-based data storage by considering issues of task partitioning, data partitioning, data synchronization, distributed file system, data replication etc.
5. To demonstrate the use of Hadoop framework, virtualization, data storage and MapReduce

**Prerequisites:** Basics of Networking, Operating System, Virtualization

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detailed Contents:**

**Part- A**

**Overview of Computing Paradigm:**

Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, Roots of cloud computing, Business driver for adopting Cloud Computing, Cloud Computing vs. Cluster computing vs. Grid computing. [3 Hours]

**Introduction to Cloud Computing:**

Cloud Types: The NIST Model, The Cloud Cube Model, Deployment models, Service Models, Benefits of Cloud Computing, Disadvantages of Cloud Computing, Role of Open Standards[3 Hours]

**Migration into Cloud:**

Introduction, Broad Approaches to Migration into Cloud, The Seven- Step Model of Migration into Cloud. [2 Hours]

**Cloud Concepts and Technologies:**

Cloud Economic, Virtualization: Definition, Characteristics and benefits of virtualization, Virtualization and cloud computing, Types of virtualization, Load balancing. Hypervisors, Multi-tenancy, Scalability and elasticity, Billing and metering of services, Application programming

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interfaces (APIs), and Service level agreement (SLA). [9 Hours]

**Part-B**

**Cloud Security:**

Role of Security, Types of Attacks, Network Security, and Survey on Potential Cloud Barriers in adopting Cloud Computing, New Threats related to Cloud Computing, Security Stack, Gartner's Seven Cloud Computing Security Risks. Other Cloud Security Issues, Virtualization, Access Control & Identity Management, Application Security, Data Life Cycle Management. [9 Hours]

**Cloud Computing Platforms:**

Study and comparison of various open source and commercial cloud platforms. Open source cloud platforms: Openstack, Eucalyptus, and Nebula etc. Commercial cloud platforms: Amazon Elastic compute cloud (EC2), Google Cloud platform, and MS Azure etc. [6 Hours]

**Cloud based Data Storage:**

Introduction to Map Reduce and Hadoop Distributed File System (HDFS), Design of data applications based on Map Reduce in Apache Hadoop, Basic HDFS commands. [4 Hours]

**Textbooks:**

1. Barrie Sosinsky (2013), Cloud Computing Bible, Wiley India Pvt. Ltd.
2. Raj Kumar Buyya, James Broberg, Andrezej M. Goscinski (2011), Cloud Computing: Principles and paradigms, Wiley India Pvt. Ltd.
3. Anthony Velte, Toby Velte, Robert Elsenpeter (2009), Cloud Computing: A practical Approach, Tata McGraw Hill

**Reference Books:**

1. Michael Miller (2008), Cloud Computing, Que Publishing
2. Anthony Velte, Toby Velte and Robert Elsenpeter (2014), Cloud Computing: A practical Approach by Tata McGraw Hill
3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper (2009), Cloud Computing for dummies.

**Online Courses and Video Lectures:**

1. Cloud computing By Prof. Soumya Kanti Ghosh, IIT Kharagpur  
[https://swayam.gov.in/nd1\\_noc20\\_cs20/preview](https://swayam.gov.in/nd1_noc20_cs20/preview)
2. Google Cloud Computing Foundations Course By Prof. Soumya Kanti Ghosh, Multifaculty, IIT Kharagpur, Google Cloud [https://swayam.gov.in/nd1\\_noc20\\_cs55/preview](https://swayam.gov.in/nd1_noc20_cs55/preview)

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**Subject Code:** LMIT-120  
**Subject Name:** Cloud Computing Laboratory

<b>Programme:</b> M. Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 50	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Programme Elective-V

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. Apply knowledge of software tools and techniques with hands-on experience for Cloud related applications.
2. Design solutions for the understanding of the virtual machines, networks and managing users in Cloud Infrastructure.
3. To conduct investigation and develop programming skills in Cloud Computing related applications.
4. Use the modern engineering tools/platforms such as Open stack, Hadoop for solving problems related to Cloud Computing
5. Function on multi-disciplinary teams through mini projects for exploring applications of Cloud Computing in different sectors.

**Pre-requisites:** Basic programming skills and computer fundamentals

**Detailed Contents:**

1. Install VirtualBox/VMware Workstation with different flavors of Linux or windows OS on top of Linux/windows.
2. Introduction to OpenStack and its components.
3. Installation of OpenStack using RDO packstack.
4. Creating and launching a basic virtual machine
5. Creating and managing images and templates
6. Creating and managing networks
7. Creating and managing users
8. Managing security groups and policies
9. Connecting to virtual machine/server from local computer
10. Installation and Configuration of Hadoop.
11. Create simple applications like wordcount using Hadoop Map/Reduce.

**Mini Project:** By using various concepts of syllabus students required to prepare a project in a group of two to three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as must give a presentation of the same.

**Note:** It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required)

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**Subject Code:** MIT-121

**Subject Name:** Applications of Data Science

<b>Programme:</b> M. Tech.	<b>L: 3 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 100	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 150	<b>Course Type:</b> Programme Elective-V

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. Describe what Data Science is and the skill sets needed to be a data scientist.
2. Explain in basic terms what Statistical Inference means.
3. Explain the significance of exploratory data analysis (EDA) in data science.
4. Describe the Data Science Process and how its components interact.
5. Apply basic machine learning algorithms for predictive modeling.
6. Identify common approaches used for Feature Generation.
7. Identify and explain fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine.
8. Create effective visualization of given data (to communicate or persuade).
9. Work effectively in teams on data science projects.

**Prerequisites:** Basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detained Contents:**

**Part-A**

**Introduction to Data Science:**

Big Data and Data Science hype and getting past the hype, Why now, Datafication, Current landscape of perspectives, Skill sets needed. [2 Hours]

**Statistical Inference:**

Populations and samples, Statistical modeling, probability distributions, fitting a model [2 Hours]

**Exploratory Data Analysis and the Data Science Process:**

Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process [3 Hours]

**Feature Generation and Feature Selection (Extracting Meaning from Data):**

Motivating application: user (customer) retention, Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms, Filters; Wrappers; Decision Trees; Random Forests [6 Hours]

**Recommendation Systems:**

Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis [6 Hours]

**Part-B**

**Mining Social-Network Graphs:**

Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs, Partitioning of graphs, Neighborhood properties in graphs[6 Hours]

**NLP:**

Foundational terms and concepts in NLP, Theory, Sentence Detection, Tokenization, Stop Words, Lemmatization, Word Frequency, Part of Speech Tagging [5 Hours]

**Data Visualization:**

Basic principles, ideas and tools for data visualization[2 Hours]

**Text Books:**

1. Cathy O'Neil and Rachel Schutt (2014), Doing Data Science, Straight Talk from The Frontline. O'Reilly.

**Reference Books:**

1. Jure Leskovek, AnandRajaraman and Jeffrey Ullman (2014), Mining of Massive Datasets. v2.1, Cambridge University Press.
2. Kevin P. Murphy (2013). Machine Learning: A Probabilistic Perspective.
3. Foster Provost and Tom Fawcett (2013). Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking.

**Online Courses and Video Lectures:**

1. Data Science for Engineers, By Prof. RaghunathanRengasamy& Prof. Shankar Narasimhan, IIT Madras, [https://swayam.gov.in/nd1\\_noc19\\_cs60/preview](https://swayam.gov.in/nd1_noc19_cs60/preview)
2. Practical Machine Learning with Tensorflow, By Prof. Ashish Tendulkar and Prof. BalaramanRavindran, Google and IIT Madras, [https://swayam.gov.in/nd1\\_noc19\\_cs81/preview](https://swayam.gov.in/nd1_noc19_cs81/preview)



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**Subject Code:** LMIT-120

**Subject Name:** Applications of Data Science Laboratory

<b>Programme:</b> M. Tech.	<b>L: 0 T: 0 P: 2</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Practical	<b>Credits:</b> 1
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 100%
<b>External Marks:</b> 50	<b>Duration of End Semester Exam(ESE):</b> 1.5 Hours
<b>Total Marks:</b> 100	<b>Course Type:</b> Programme Elective-V

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. Apply knowledge of software tools and techniques with hands-on experience for processing the raw data and convert into useful information
2. To conduct investigation and develop programming skills in Data Science related application
3. Use the modern engineering tools such as NumPy, Pandas, Matplotlib, Scikit, Seaborn etc. for solving problems related to Data Science
4. Explore data visualization methods and preprocessing tools.
5. Evaluate and compare solutions of various Data Science Techniques for a given problem
6. Create an application using various Data Science concepts for multidisciplinary fields

**Pre-requisites:** Basic programming skills and computer fundamentals and algorithms

**Detailed Contents:**

1. Familiarity with Python Libraries- NumPy, Pandas, Matplotlib, Scikit, Seaborn
2. Implementation of reading and writing from files using Pandas.
3. Familiarity with Combining Data in Pandas With merge (), join (), and concat ()
4. Implementation of Using NumPy's *np.arange()* Effectively
5. Explore the dataset using Pandas and python to Discover and handle incorrect data, inconsistencies, and missing values.
6. Implementation of various Feature Selection algorithms
7. Implementation of various correlation calculations.
8. Implementation of statistic fundamentals on any dataset to calculate measure of central tendency, variability.
9. Implementation related to Grouping Data using Pandas's GroupBy() function.
10. Histogram plotting by using any Python libraries.
11. Build a Recommendation Engine with Collaborative Filtering
  - a) To Find Similar Users on the Basis of Ratings
  - b) To Calculate the Ratings
12. Implementation of social-Network analysis for various parameters
13. Natural Language Processing With spacy in Python
14. Implementation of Python Plotting with Matplotlib for creating visualizations

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**Subject Code:** MOIT-301

**Subject Name:** Introduction to Python Programming

<b>Programme:</b> M. Tech.	<b>L: 3 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 100	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 150	<b>Course Type:</b> Open Elective

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. Master Object-oriented programming to create programs using various constructs.
2. Identify, formulate, and solve engineering problems using software development process.
3. Apply the knowledge of language constructs to program complex real life solutions.
4. Function on multi-disciplinary teams through case studies.
5. Design real-world problems and think creatively about solutions of them.

**Prerequisites:** Knowledge of Programming for Problem Solving

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detained Contents:**

**Part-A**

**Introduction Python Programming Language:-** History and Origin of Python Language, Python version numbering scheme, Features, Advantages and disadvantages, Major Applications of Python, Installing Python, Setting up Path and Environment Variables, Getting started with Python Programming, Python Interactive Help Feature.

**Software Development, Data types, Operators and Expressions:-** The software Development Process, Case study: income tax Calculator, strings, Assignment and Comments, numeric Data types and Character sets, Operators in Python, Expressions, Precedence, Associativity, Non Associative Operators, using modules. [10 Hours]

**Loops and Selection Statements:** Definite Iteration: The for Loop, Formatting Text for Output, Case Study: An Investment Report, Selection: if and if-else Statements, Conditional Iteration: The while Loop, Case Study: Approximating Square Roots.

**Strings and Text Files:** Accessing Characters and Sub-strings in Strings, Data Encryption, Strings and Number Systems, String Methods, Text Files, Case Study: Text Analysis. [9 Hours]

**Part-B**

**Lists and Dictionaries:** Lists, Defining Simple Functions, Case Study: Generating Sentences, Dictionaries, Case Study: Non-directive Psychotherapy.

**Design with Functions:** Function components, Problem Solving with Top-Down Design, Design with Recursive Functions, Case Study: Gathering Information from a File System, Managing a Program's Namespace. [9 Hours]

**Graphical User Interfaces:** The Behavior of Terminal-Based Programs and GUI-Based Programs, Coding Simple GUI-Based Programs, Windows and Window Components, Command Buttons and Responding to Events, Input and Output with Entry Fields, Defining and Using Instance Variables, Case Study: The Guessing Game Revisited, Useful GUI Resources.[8 Hours]

**Text Books:**

1. Kenneth A. Lambert, Martin Osborne, “Fundamentals of Python First Programs”, 2<sup>nd</sup> Edition, Cengage Learning, 2019.
2. Kenneth A. Lambert, Martin Osborne, “Fundamentals of Python: First Programs through Data Structures”, 1<sup>st</sup> Edition, Cengage Learning, 2010.

**Reference Books:**

1. Martin C. Brown, “Python The complete Reference”, McGraw Hill Education.
2. Allen B. Downey, “Think Python”, 1<sup>st</sup> Edition, Green Tea Press, 2012.

**E-Books and Online Learning Material:**

1. Fundamentals of Python First Programs by Kenneth A. Lambert  
<https://archive.org/details/FundamentalsOfPythonFirstPrograms2ndEdition>  
Accessed on Feb. 20, 2019
2. Learning Python byFabrizio Romano<http://www.allitebooks.com/learning-python/> Accessed on Feb 20, 2019
3. Python Essential Reference by Beazley<http://lib.myilibrary.com?id=267855>  
Accessed on Feb 20, 2019
4. Starting Out with Python by Gaddis<http://lib.myilibrary.com?id=265135>  
Accessed on Feb 20, 2019
5. Beginning Programming with Python For Dummies by John Paul Mueller<http://www.allitebooks.com/beginning-programming-with-python-for-dummies-2nd-edition>  
Accessed on Feb 20, 2019

**Online Courses and Video Lectures**

- 1.<https://nptel.ac.in/courses/115104095> Accessed on Feb 20, 2019
2. <https://nptel.ac.in/courses/106106145> Accessed on Feb 20, 2019
3. <https://nptel.ac.in/courses/106106182> Accessed on Feb 20, 2019
4. <https://www.coursera.org/learn/python> Accessed on Feb 20, 2019
5. <https://www.coursera.org/learn/interactive-python-1> Accessed on Feb 20, 2019

Guru Nanak Dev Engineering College, Ludhiana  
Department of Information Technology  
M. Tech (IT) Scheme 2019  
Semester 3  
**Subject Code:** MOIT-302  
**Subject Name:** Data Structures

<b>Programme:</b> M. Tech.	<b>L: 3 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 100	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 150	<b>Course Type:</b> Open Elective

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. Create and evaluate new algorithms to solve complex engineering problems.
2. Illustrate various data structures to solve multi-disciplinary projects.
3. Utilize the templates for modularity.
4. Compare and classify various data structures
5. Demonstrate the reusability of data structures for implementing complex iterative problems

**Prerequisites:** Knowledge of Programming for Problem Solving

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detained Contents:**

**Part-A**

**Introduction:** Definition and brief description of various data structures, operations on data structures, Algorithm development, Complexity analysis, Big O notation, Time space trade-off [4 Hours]

**Arrays:** Linear and Multi-dimensional arrays and their representation, operations on arrays, Linear Search, Binary Search, Sparse matrices and their storage [4 Hours]

**Stacks:** Array Representation and Implementation of Stacks, Operations on Stacks, Application of stacks: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack, balanced parenthesis checking. [4 Hours]

**Recursion:** Recursive definition and examples of recursion, Tower of Hanoi Problem, tail Recursion [2 Hours]

**Queues:** Sequential representation of queue, linear queue, circular queue, operations on linear and circular queue, deque, priority queue. [5 Hours]

**Part- B**

**Linked Lists:** Linear linked list, operations on linear linked list, doubly linked list, operations on doubly linked list, Circular Linked list, Garbage collection and Compaction, Linked representation of Stack, Linked representation of a Queue. [6 Hours]

**Trees:** Basic terminology, sequential and linked representations of trees, traversing a binary tree, brief introduction to threaded binary trees, AVL trees and B-trees, Heap Trees. [4 Hours]

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**Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm [4 Hours]

**Graphs:** Basic terminology, representation of graphs (adjacency matrix, adjacency list), traversal of a graph (breadth - first search and depth - first search) [3 Hours]

**Text Books:**

1. Seymour Lipschitz, "Data Structures", Scamum's Outline series, Tata McGraw Hill.
2. Y. Langsam, M. J. Augenstein, A. M. Tanenbaum " Data Structures using C and C++", PrenticeHall of India.
3. SartajSahni, "Data Structures, Algorithms and Applications in C++", Tata McGraw Hill.

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 Semester 3  
**Subject Code:** MOIT-303  
**Subject Name:** Database Management System

<b>Programme:</b> M. Tech.	<b>L: 3 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 36
<b>Theory/Practical:</b> Theory	<b>Credits:</b> 3
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 20%
<b>External Marks:</b> 100	<b>Duration of End Semester Exam(ESE):</b> 3 Hours
<b>Total Marks:</b> 150	<b>Course Type:</b> Open Elective

**Course Outcomes:**

**On completion of the course the student will have the ability to:**

1. Design Physical and object relational database.
2. Identify, formulate database design, Functional dependencies and Recovery techniques.
3. Use the techniques, skills and tools such as query handling, normalized relations
4. Apply the Applications of spatial and multimedia databases for real world.
5. Apply knowledge of database system, Data warehouse, data mining and SQL Structure.

**Prerequisites:** Basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics.

**Additional Material Allowed in ESE:** NIL (Mention anything like graph, calculator etc, if required in exam)

**Detained Contents:**

**Part-A**

**Introduction to Database System:** Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators, Transaction Management, Components of a Database management Distributed Processing and Client Basic Concepts, Keys, Design Issues, ER Diagrams [5 Hours]

**Relational Model:** Structures of relational databases, Integrity Constraints, Logical database Design, Tables, Views, Data Dictionary. Relational Algebra, Relational Calculus. SQL: Basic Structures, Query Handling, Embedded SQL, Triggers, Security and Authorization. [10 Hours]

**Part-B**

**Relational Database Design:** Functional Dependencies, Multivalued Dependencies, Normal Forms (1NF ,2NF, 3NF, BCNF, 4NF and 5NF), Decomposition into Normalized Relations. [6 Hours].

**Transaction Management and Concurrency Control:** Transaction Management and Concurrency Control ACID properties, failure and recovery, concurrency control, Serializability, Two phase locking protocols, Timestamp and Validation based protocols, deadlocks, logs and logging protocol [5 Hours]

**Recovery Systems:** Failure Classification, Recovery and Atomicity, Log Based Recovery, Shadow Paging, Recovery with Concurrent Transactions [4Hours]

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**Data Mining:** Introduction to Data Mining, Process of Data Mining, Applications of Data Mining, Data Warehousing, Advantages of Data Warehousing, Data Marts, Introduction and Applications of Spatial and Multimedia Databases. [6Hours]

**Text Books:**

1. Abraham Silberschatz, S. Sudarshan, Henry F. Korth, “Database System Concepts”, 6th Edition, Tata McGraw - Hill Education, 2011.
2. Shamkant B. Navathe, RamezElmasri, “Fundamentals of Database Systems”, 6th Edition, Addison Wesley Pub Co Inc, 2010.
3. Connolly, “Specifications of Database Systems: A Practical Approach to Design, Implementation and Management”, 4th Edition, Pearson India, 2008.

**Reference Books:**

1. Essentials of Data Base Management System - Alexis Leon and Mathews Leon - Vikas Publishing Limited, Chennai First Edition, 2009
2. SQL and PL/SQL – Sharad Maheswari Ruchin Jain - Firewall Media New Dehi First Edition 2010



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**Subject Code: MAC-101**

**Subject Name: English for Research Paper Writing**

<b>Programme:</b> M. Tech.	<b>L: 2 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Theory	<b>Credits:</b> Non- Credit Course
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 0	<b>Duration of End Semester Exam(ESE):</b> NA
<b>Total Marks:</b> 50	<b>Course Type:</b> Audit Course

**Course Outcomes:**

**After studying this course the student will be able to:**

1. Understand the process for the improvement of writing skills
2. Understand the process for the improvement the level of readability
3. Learning about the categorization of different sections
4. Elaborate the correlation between title and contents
5. Attainment of key skills for writing title, abstract, introduction, literature, methods, results, discussion and conclusion
6. Design the useful phrases for good quality of paper

**Prerequisites:** Knowledge of Technologies, English Reading and Writing Skills

**Detailed Contents:**

**Part-A**

**Module 1:** Planning and preparation, word order, breaking up long sentences, structuring paragraphs and sentences, being concise and removing redundancy, avoiding ambiguity and vagueness [4 hrs]

**Module 2:** Clarifying who did what, highlighting your findings, hedging and criticizing, paraphrasing and plagiarism, sections of a paper, abstracts, and introduction [4 hrs]

**Module 3:**

Review of the literature, methods, result, discussion, conclusions, and the final check [4hrs]

**Part-B**

**Module 4:**Key skills are needed when writing a title, key skills are needed when writing an abstract, key skills are needed when writing an introduction, key skills are needed when writing a review of the literature[4 hrs]

**Module 5:** Skills are needed when writing the methods, skills needed when writing the results, skills are needed when writing the discussion, and skills are needed when writing the conclusions [4 hrs]

**Module 6:** Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission [4 hrs]

**Text Books:**

1. R. Goldbort, "Writing for science", Yale university press, 2006. (available on Google books)
2. R. Day, "How to write and publish a scientific paper", Cambridge university press, 2006.

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3. N. Highman, "Handbook of writing for the mathematical sciences", SIAM Highman's book, 1998.

**Reference Books:**

1. Adrian Wallwork, "English for writing research papers", Springer Newyork Dordrecht Heidelberg London, 2011.

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 Semester 3  
**Subject Code:** MAC-102  
**Subject Name:** Disaster Management

<b>Programme:</b> M. Tech.	<b>L: 2 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Theory	<b>Credits:</b> Non- Credit Course
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 0	<b>Duration of End Semester Exam(ESE):</b> NA
<b>Total Marks:</b> 50	<b>Course Type:</b> Audit Course

**Course Outcomes:**

**After studying this course the student will be able to:**

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
1. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
2. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
3. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

**Detailed Contents:**

**Part-A**

**Introduction:** Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude. [4 Hours]

**Repercussions of Disasters and Hazards:** Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem, Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts  
 [4 Hours]

**Disaster Prone Areas in India:** Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics [4 Hours]

**Disaster Preparedness and Management:** Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness. [4 Hours]

**Risk Assessment:** Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation In Risk Assessment, Strategies for Survival. [4 Hours]

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**Disaster Mitigation:** Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation, Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation in India.

[4 Hours]

**Text Books:**

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “NewRoyal book Company.
2. Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall OfIndia, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies”,Deep&Deep Publication Pvt. Ltd., New Delhi.

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 Semester 3  
**Subject Code:** MAC-104  
**Subject Name:** Value Education

<b>Programme:</b> M. Tech.	<b>L: 2 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Theory	<b>Credits:</b> Non- Credit Course
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 0	<b>Duration of End Semester Exam(ESE):</b> NA
<b>Total Marks:</b> 50	<b>Course Type:</b> Audit Course

**Course Outcomes:**

**After studying this course the student will be able to:**

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character
4. Knowledge of self-development
5. Learn the importance of Human values
6. Developing the overall personality

**Detailed Contents:**

**Part-A**

**Module 1:** Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgements [6 Hours]

**Module 2:** Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline [6 Hours]

**Part-B**

**Module 3:** Personality and Behaviour Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, Love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature [6 Hours]

**Module 4:** Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively [6 Hours]

**Text Books:**

4. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

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Semester 3  
**Subject Code:** MAC-105  
**Subject Name:** Constitution of India

<b>Programme:</b> M. Tech.	<b>L: 2 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Theory	<b>Credits:</b> Non- Credit Course
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 0	<b>Duration of End Semester Exam(ESE):</b> NA
<b>Total Marks:</b> 50	<b>Course Type:</b> Audit Course

**Course Outcomes:**

**After studying this course the student will be able to:**

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
4. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
5. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
6. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
7. Discuss the passage of the Hindu Code Bill of 1956.

**Detailed Contents:**

**Part-A**

**History of Making of the Indian Constitution:**

History, Drafting Committee, (Composition & Working) [4 Hours]

**Philosophy of the Indian Constitution:**

Preamble, Salient Features [4 Hours]

**Contours of Constitutional Rights & Duties:**

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties [4 Hours]

**Part-B**

**Organs of Governance:**

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions [6 hours]

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**Local Administration:**

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO ZilaPachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy [6 Hours]

**Text Books:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Ed., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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**Subject Code:** MAC-106  
**Subject Name:** Pedagogy Studies

<b>Programme:</b> M. Tech.	<b>L: 2 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Theory	<b>Credits:</b> Non- Credit Course
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 0	<b>Duration of End Semester Exam(ESE):</b> NA
<b>Total Marks:</b> 50	<b>Course Type:</b> Audit Course

**Course Outcomes:**

**After studying this course the student will be able to:**

1. Analyze the pedagogical practices being used by teachers in formal and informal classrooms in developing countries
2. Examine the effectiveness of the pedagogical practices, in what conditions, and with what population of learners.
3. Identify how school curriculum and guidance materials best support effective pedagogy.
4. Ability to design Research problems
5. Identify and explore barriers for learning

**Detailed Contents:**

**Part-A**

**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education, Research questions, Overview of methodology and Searching, Thematic overview: Pedagogical practices being used by teacher's informal and informal classrooms in developing countries. [8 Hours]

**Pedagogical practices:** Methodology for the in depth stage: quality assessment of included studies, How can teacher education(curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy, Theory of change, Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies. [8 Hours]

**Part-B**

**Professional Development:** Alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to Learning: limited resources and large class sizes. [4 Hours]

**Research gaps and future directions:** Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment and Dissemination and research impact [4 Hours]

**Text Books:**

1. Abraham Silberschatz, S. Sudarshan, Henry F. Korth, "Database System Concepts", 6th Edition, Tata McGraw - Hill Education, 2011.
2. Shamkant B. Navathe, Ramez Elmasri, "Fundamentals of Database Systems", 6th Edition, Addison Wesley Pub Co Inc, 2010.
3. Connolly, "Specifications of Database Systems : A Practical Approach to Design, Implementation and Management", 4th Edition, Pearson India, 2008.



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**Reference Books:**

1. Akyeamong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count International Journal Educational Development, 33 (3):272–282.
2. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
3. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

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Semester 3

**Subject Code: MAC-107**

**Subject Name: Stress Management by Yoga**

<b>Programme:</b> M. Tech.	<b>L: 2 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Theory	<b>Credits:</b> Non- Credit Course
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 0	<b>Duration of End Semester Exam(ESE):</b> NA
<b>Total Marks:</b> 50	<b>Course Type:</b> Audit Course

**Course Outcomes:**

**After studying this course the student will be able to:**

1. To achieve overall health of body and mind
2. To overcome stress
3. Develop healthy mind in a healthy body thus improving social health and improve efficiency

**Prerequisites:** Knowledge of Technologies, English Reading and Writing Skills

**Detailed Contents:**

**Part-A**

**Module 1:**

Definitions of Eight parts of yog.( Ashtanga)[8 Hours]

**Module 2:**

Yam and Niyam.Do's and Dont's in life.

- i) Ahinsa, satya, astheya, bramhacharya and aparigraha
- ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan)[8 Hours]

**Part-B**

**Module 3:**

Asan and Pranayam.

- i) Various yog poses and their benefits for mind & body
- ii)Regularization of breathing techniques and its effects-Types of pranayam)[8 Hours]

**Text Books:**

1. 'Yogic Asanas for Group Training-Part-I' :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

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**Subject Code: MAC-108**

**Subject Name: Personality Development through Life Enlightenment Skills**

<b>Programme:</b> M. Tech.	<b>L: 2 T: 0 P: 0</b>
<b>Semester:</b> 3	<b>Teaching Hours:</b> 24
<b>Theory/Practical:</b> Theory	<b>Credits:</b> Non- Credit Course
<b>Internal Marks:</b> 50	<b>Percentage of Numerical/Design Problems:</b> 0%
<b>External Marks:</b> 0	<b>Duration of End Semester Exam(ESE):</b> NA
<b>Total Marks:</b> 50	<b>Course Type:</b> Audit Course

**Course Outcomes:**

**After studying this course the student will be able to:**

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students
4. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
5. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
6. Study of Neetishatakam will help in developing versatile personality of students.

**Detailed Contents:**

**Part-A**

**Module 1:**

Neetisatakam-Holistic development of personality: Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism), Verses- 26,28,63,65 (virtue), Verses- 52,53,59 (dont's), Verses- 71,73,75,78 (do's) [8 Hours]

**Module 2:**

Approach to day to day work and duties, Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,Chapter 18-Verses 45, 46, 48. [8 Hours]

**Part-B**

**Module 3:**

Statements of basic knowledge, Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17, 18, Personality of Role model, Shrimad BhagwadGeeta:Chapter2-Verses 17, Chapter 3-Verses 36,37,42,Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63 [8 Hours]

**Text Books:**

1. “Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita Ashram, Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath,
3. Rashtriya Sanskrit Sansthanam, New Delhi.