Gujarat University

M. Sc. Computer Science [S. F.]
Semester-1 Syllabus
Gujarat Arts & Science College, Ahmedabad.

M.Sc. Computer Science EFFECTIVE FROM ACADEMIC YEAR 2016-2017				
	SEM-II	**Th.**	**Tu.**	**Pr.**
MSC-407	Data Warehousing and Data Mining	4	1	-
MSC-408	Python Programming	4	-	3
MSC-409	Information Security	4	-	3
MSC-410	Smart Device Computing using Android	4	-	3
MSC-411	Advance Computing Technology	4	-	-
MSC-412	Computer Science Practical (Based on Python Programming, Information Security& Smart Device Computing using Android)			

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Unit	Computer Theory MSC – 407 4 Credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Computer Theory MSC – 408 4 Credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Computer Theory MSC – 409 4 Credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Computer Theory MSC – 410 4 Credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Computer Theory MSC – 411 4 Credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week	Computer Practical COM – 412 4 Credit Total 100 Marks Internal 30 Marks External 70 Marks 4 hrs/Week
I	Introduction to Data Warehousing	Introduction to Python	Security Basics	The Basics	Cluster Computing at Glance	Consist of Practical Experiments including Smart Device Computing Using Android:33 Experiments Python Programming:30 Experiments Information Security: 10 Exercises
II	Online Analytical Processing	Function Scoping and Abstraction	Network Security	User Interface	Cluster Step and Administration	
III	Introduction to Data Mining	Structured Types Mutability and Higher Order Functions	Other Security Areas	Background Tasks	Constructing Scalable Services	
IV	Concept Description and Association rule Mining	Testing Debugging, Exception and Assertion	Conventional Encryption	Data Saving, Retrieving and Loading	Introduction to Grid And its Evolution	
V	Classification And Prediction	Classes and Object Oriented Programming	Symmetric Cipher	Polish and Publish	Implementing Production Grids	
VI	Clustering	Simple Algorithms and Data Structures	Asymmetric Encryption		Anatomy of Grid	
VII	Other Data Mining Techniques	Advanced Topics	IP Security, Email Security		Introduction to Cloud Computing	
VIII	Mining Complex Data Types		Web Security		Nature of Cloud	
IX	Advance Topics				Cloud Elements	

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Paper: 407 Subject: Data Warehousing and Data Mining

Unit-1: Introduction to Data Warehousing

- Why reporting and Analyzing data, Raw data to valuable information-Lifecycle of Data
- What is data warehousing - The building Blocks: Defining Features – Data warehouses and data marts - Overview of the components - Metadata in the data warehouse
- Need for data warehousing
- Basic elements of data warehousing

Unit-2: Online Analytical Processing

- OLTP and OLAP systems
- Star schema for multidimensional view
- Multifact star schema or snow flake schema
- Introductions to OLAP Tools

Unit-3: Introduction to Data Mining

- Motivation for Data Mining - Data Mining: On What kind of Data?
- Definition and Functionalities: What kind of patterns can be mined?
- Classification of DM Systems
- Integration of a Data Mining system with a Database or a Data Warehouse
- Issues in DM
- KDD Process

Unit-4: Concept Description and Association Rule Mining

- What is concept description?
- Data Generalization and summarization-based characterization
- Association Rule Mining: Market basket analysis - basic concepts
- Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm
- Associative Classification – Rule Mining

Unit-5: Classification & Prediction

- Introduction and Applications of classification
- Data Preparation for classification and prediction
- Tree pruning
- Measures for Attribute selection -Info.Gain, GINI Index, Entropy, Classification error
- Rule based classification, its coverage and accuracy, Advantages and limitations
- Building Classification rules, Direct and Indirect Methods
- Comparative study of various classification algorithms

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Unit-6: Clustering

- Introduction and Applications of clustering
- Types of Data Variables in clustering-Interval scaled, Binary, Nomonal, Ordinal, Ratio Scaled
- Categorization of Major clustering Methods
- Partitioning Methods - k-Means algorithm and k-Medoids
- Introduction other clustering methods- Hierarchical Clustering, Agglomerative Clustering, Density based Clustering Methods, Grid-Based Clustering, Model Based Clustering

Unit-7: Other Data Mining Techniques

- Data Prediction-Linear regression based prediction
- Outlier Analysis- Statistical based, Distance based, Deviation based
- Conceptual Techniques- Data characterization and Generalization, Data Comparison or Discrimination

Unit-8: Mining Complex Data Types

- Mining Time-Series and Sequence Data
- Mining Text Databases
- Mining the Multimedia Databases
- Mining the World Wide Web

Unit-9: Advance topics

Big Data:

- Introduction to big data: distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

Hadoop:

- Introduction to Hadoop architecture: Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering – Monitoring & Maintenance.

Reference Books:

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann Core Java, Volume II – Advanced Features, Eight Edition, Pearson
2. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.
3. Data Mining Techniques, second edition, Arun K pujari, Universities Press
4. Data Mining: Concepts and Techniques, 2nd Edition, Han, Elsevier

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Paper: 408 Subject: Python Programming

Unit-1: Introduction to Python

- The basic elements of python
- Branching Programs
- Control Structures
- Strings and Input
- Iteration

Unit-2: Functions, Scoping and Abstraction

- Functions and scoping
- Specifications
- Recursion
- Global variables
- Modules
- Files
- System Functions and Parameters

Unit-3: Structured Types, Mutability and Higher-order Functions

- Strings, Tuples, Lists and Dictionaries
- Lists and Mutability
- Functions as Objects

Unit-4: Testing, Debugging, Exceptions and Assertions

- Types of testing – Black-box and Glass-box
- Debugging
- Handling Exceptions
- Assertions

Unit-5: Classes and Object-Oriented Programming

- Abstract Data Types and Classes
- Inheritance
- Encapsulation and Information Hiding

Unit-6: Simple Algorithms and Data structures

- Search Algorithms
- Sorting Algorithms
- Hash Tables

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Unit-7: Advanced Topics

- Regular Expressions – REs and Python
- Plotting using PyLab
- Security – Encryption and Decryption , Classical Cyphers

Reference Books:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. R. Nageswara Rao, "Core Python Programming", dreamtech
3. Wesley J. Chun. "Core Python Programming - Second Edition", Prentice Hall
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Pyhon", Wiley
5. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication
6. Luke Sneeringer, "Professional Python", Wrox
7. "Hacking Secret Ciphers with Python", Al Sweigart, URL- https://inventwithpython.com/hacking/chapt ers

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Paper: 409 Subject: Information Security

Unit-1: Security Basics

- Computer Security
- Information Security
- Threat and Attacks
- Malicious Logic
- Countermeasures
- Security Policies
- Confidentiality Polices
- Integrity Policies

Unit-2: Network Security

- Security Incidents and Attacks
  - Boundary Devices
- Firewalls Software - Concept, Types, Limitation and Implementation
- VPN - Concept, Limitation and Implementation
- Intrusion Detection and Prevention- Concept, Limitation and Implementation

Unit-3: Other Security Areas

- Web threats and attacks
- Database threats and attacks
- Security in wireless network-issues and solutions
- Security in e-commerce, m-commerce-issues and solutions

Unit-4: Conventional Encryption

- Conventional Encryption Model,
- Steganography
- Classical Encryption Techniques

Unit-5: Symmetric Ciphers

- Encryption techniques (Caesar cipher, zebra technique, vinegar cipher, transposition cipher, play fair cipher, hill cipher)
- Block Cipher
- DES, Triple DES, AES
- Contemporary Symmetric Cipher

Unit-6: Asymmetric encryption

- Use of Number Theory
- Public-key Cryptography
- RSA

- Authentication Protocols
- Message authentication and hash function
- Hash algorithms - MD5 , SHA1
- Digital signatures
- SSL

Unit-7: IP Security E-Mail Security

- IP Security Overview,
- Architecture, Authentication Header, Encapsulation
- Security Payload, Combining Security Association, Key Management,
- Pretty Good Privacy, S/Mime And Types

Unit-8: Web Security

- Web Security Requirement, SSL And Transport Layer Security
- Secure Electronic Transactions
- Firewall Design Principles
- Trusted Systems

Reference Books:

1. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill
2. Cryptography and Network Security (2nd Ed.), Atul Kahate, TMH
3. Information Systems Security, Godbole, Wiley-India
4. Information Security Principles and Practice, DevenShah, Wiley-India

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Paper: 410 Subject: Smart Device Computing using Android

Unit-1: The Basics

- Hello World: Intro to Android, why develop apps for Android? Flavors of Android operating systems, Challenges of developing for Android (multiple OS, need backwards compatibility, need to consider performance and offline capability)
- Concept: Create Your First Android App: Overview of the development process - Java, Android Studio, Project layout in Android Studio, Target and minimum SDKs, Android Virtual Device (AVD) Monitor, viewing logs in logcat and AVD, Android manifest file, App Architecture: An app consists of one or more activities. For an activity, write Java code and layout xml, and hook them together, and register the activity in the manifest file.
- Concept: Layouts, Views and Resources: Layout elements can be viewed and edited in Layout Editor and XML, Introduction to the range of UI elements, Resources (layouts, strings, styles, themes), Identifying resources with IDs, programmatically referencing resources using resource IDs, on Click attribute, getting user input from a view, Programmatically changing UI elements, Layout Managers, Defining layouts for activities, inflating the layout.
- Concept: Scrolling Views: How to make activities scrollable: compare ScrollView, ListView, RecyclerView , Getting the resource ID for a UI element by inflating a layout (needed for RecyclerView) , How to implement RecyclerView (requires layout managers and ViewHolders) , Performance impications of different kinds of scrolling UI elements
- Concept: Resources to Help You Learn: Resources to help you learn: Samples that ship with the SDK, Templates for projects, developer.android.com, Android developer blog , Android developer YouTube channel, Source code and samples in github, Stack overflow, Google search!
- Activities and Intents :About activities, Defining Activities , Activity Lifecycle , Activity navigation , About intents ,Explicit vs Implicit intents ,Passing info to new activity ,Returning data from activity
- The Activity Lifecycle and Managing State: Activity lifecycle , Activity lifecycle callback methods , Activity instance state
- Starting Activities with Implicit Intents: Starting activities by sending implicit intents, Intent filters and enabling your activities to receive intents, ShareCompat
- Testing and Debugging, and Backwards Compatibility: Debugging your apps, Testing your app, Support libraries

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Unit-2: User Interface

- User Input Controls: Getting user input , Changing keyboards , Buttons , Dialogs and pickers , Spinners, checkboxes, and radio buttons , Gestures , Speech recognition (not done), Sensors (not done)
- Menus: Options menu, contextual menus (floating and action bar), and popup menu, Adding menu items. Handling on Clicks from menus.
- Screen Navigation: Terminology, Different ways a user can navigate through an app, Action bar, Settings menu, Navigation drawer, Directed workflow (funnels), Best practices for navigation
- Themes and Styles: Best practices for themes and styles, Performance benefits for themes, When and how to use drawables, best practices for drawable, When and how to use nine-patches, best practices for nine-patches, Tools for creating drawables
- Material Design: What is material design? Material design best practices. Material Design guidelines, Implementing Material Design look and feel, with compatibility with previous versions, Support library for Material Design design, Transitions and Animations
- Accessibility: Why accessibility matters, Accessibility considerations: Color blindness, poor vision, poor hearing, physical limitations, Accessibility guidelines , Testing for accessibility , Screen readers, Making your app more accessible: Color and Contrast, button size --> Material Design guidelines, considerate layouts and navigation
- Localization: How to prep your app for localization, LTR and RTL (eg Arabic) text.
- Testing the User Interface: Automated testing of UIs, User testing your UI with real users, Using the Espresso and UI Automator frameworks for testing UIs

Unit-3: Background Tasks:

- Connect to the Internet: Background Tasks, Synchronous versus async tasks, What is the UI thread and when should you use it? , Example of a background task -- retrieving data over the internet, Creating background tasks. (schedule, send data, etc.) , Implementing AsyncTask (doInBackground(), callbacks) , Limitations of AsyncTask , Passing info to background tasks, Initiating background tasks, Scheduling background tasks (intro only, more later).
- Connecting to the Internet: Permissions, Building URIs, Opening and closing Internet connections, Parsing JSON in Android. (Because it's common.) , Sending requests and parsing response.
- AsyncTaskLoade: Intro to AsyncTaskLoader , loadInBackground() , AsyncTaskLoader callbacks , Benefits of loaders
- Broadcast Receivers: What is a Broadcast Receiver and a Broadcast Intent? , Broadcast Receiver Security and Lifecycle
- Services: What is a service? Long running task without a UI, Difference between Activity and Service , Start andstop services, Lifecycle methods, Foreground services, IntentService class, App priority (critical, high, low), How to create a new Service.

- Notifications: What is a Notification? , Notification Design Guidelines.
- Triggering, Scheduling, and Optimizing Background: AlarmManager
- Transferring Data Efficiently: Less data, less often! Cell radio life cycle, Job Scheduler. Why to use Job Scheduler instead of SyncManager/SyncAdapter, Difference between alarms and job schedulers.

Unit-4: Data -- Saving, Retrieving, Loading

- Storing Data in your app: Internal versus external storage, Privacy, sharing, security, encryption of your data , Shared Preferences: Store private primitive data in key-value pairs , SQLite Databases: Store structured data in a private database , Store data on the web with your own network server, Firebase for storing and sharing data in the cloud, Concept: Preferences , What are Settings and Preferences? , Settings best practices (harder to take away settings than to add, for usability reasons, Storing and retrieving preferences as key/value pairs using SharedPreference, Different Settings types, Settings menu, Using Activity and PreferenceFragments to allow users to set preferences
- Store data using SQLite database: Overview of SQLite, OpenHelper Android class , Querying (dev) Searching (user) databases , Best practices for using databases in Android Best practices for testing your database
- Content Providers: When to implement content providers , How to implement content providers (overview), Content URIs , UriMatcher, Content Provider authorities , Required methods on ContentProvider (query, insert, delete, update) , MIME types , Contracts , Making content provider data accessible to other apps by modifying manifest, and protecting data with permissions.
- Using Loaders to Load and Display Data: Using loaders to asynchronously load data into an activity or fragment, Benefits of Loaders -- why use them? , Loader states (started, stopped, reset) , LoaderManager , Methods & callbacks to implement in Loaders: loadInBackground(), deliverResult() onStart/StopLoading(), onReset/Cancelled()),Registering listeners , Using CursorLoader with ContentProviders

Unit-5: Polish and publish

- Permissions: The permissions model
- Libraries: Using libraries
- Widgets: What are widgets? When to use them and how to implement them.
- Publishing your App: Different ways to monetize your app (overview only)
- Making and publishing APKs: Guidelines for publishing in Google Play , Make and sign the APK, Beta test your app , Publish your app to Google Play

Reference Books:

1. Pro Android by Sayed Y. Hashimi and Satya Komatineni, Springer, New York, 2009
2. Android Programming by Nicolas Gramlich
3. Beginning Android Application Development by Wei-Meng Lee
4. Android Application Development for Dummies by Donn Felker

Paper: 411 Subject: Advance Computing Technology

Unit-1: Cluster Computing at Glance

- Ease of Computing
- Scalable Parallel Computer Architecture
- Towards Low Cost Parallel Computing & Motivation
- A Cluster Computer And its Architecture
- Cluster Classification
- Commodity Components fir Clusters
- Network Services/Communication SW
- Cluster Middleware and Single Systems Image
- Resource management & Scheduling (RMS)
- Cluster Applications
- Representative Cluster Systems
- Clusters of SMPS

Unit-2: Cluster Setup and Administration

- Setting up the cluster
- Security
- System Monitoring
- System Tuning

Unit-3: Constructing Scalable Services

- Environment
- Resource sharing
- Resource sharing enhanced locality
- prototype implementation and extension

Unit-4: Introduction to Grid and its Evolution

- Beginning of the grid
- Building blocks of the grid
- Grid applications and application middleware
- Future of the grid
- Evolution of the Grid: first, second and third generation

Unit-5: Implementing Production Grids

- Grid context
- Grid support for collaboration
- Building an initial multisite
- Computational and data grid
- Cross site trust management
- Transition to a prototype production grid

Unit-6: Anatomy of Grid

- Virtual organizations
- Nature of grid architecture
- Grid architecture description and practice
- Intergrid protocols
- Relation to other technologies
- Other perspective on grids

Unit-7: Introduction to Cloud Computing

- Defining Clouds
- Cloud Providers
- Consuming Cloud Services
- Cloud Models – Iaas, Paas, SaaS
- Inside the cloud
- Administering cloud services
- Technical interface
- Cloud resources

Unit-8: Nature of cloud

- Tradition data center
- Cost of cloud data center
- Scaling computer systems
- Economics
- Cloud work load
- Managing data on clouds
- Public, private and hybrid clouds

Unit-9: Cloud Elements

- Infrastructure as a service
- Platform as a Service
- Software as a Service

Reference Books:

1. Cloud Computing, A Practical Approach, Anthony Velte, Toby Velte, Robert
2. Clouding Computing with Windows Azure Plaform, Roger Jennings, Wiley India
3. Virtualization for Dummies – Bernand Golden, Wiley India
4. Cloud Computing – Bible, Berrie Sonsisky, Wiley (India)
5. Cloud Security – Ronald Krutz, Wiley (India)

Paper: 412 Subject: Smart Device Computing using Android

1. Install Android Studio, Hello World, Logging
   - Install Android Studio.
   - Create a virtual device.
   - Create and Run Hello World on emulator and device.
   - Explore project layout.
   - Generate and view log statements.
   - Explore manifest file.

2. Practical: Make Your First Interactive UI
   - Add Views and UI elements in Layout Editor to the app's home screen.
   - Edit layout XML.
   - Add click behaviour to a button (show a toast).
   - Change the UI through a button click
   - Write a method to use string resource to define a message to appear in the UI.
   - Experiment with using different layouts.
     - Explore other UI Elements in the Layout Manager.

3. Practical: Working with TextView Elements
   - Use a scroll view for text with minor HTML formatting

4. Practical: Learning Resources
   - Get answers from android.developer.com.
   - Create new projects with different templates.
   - Create a new project based on a sample in the SDK.
   - Find out how to add a launcher icon for your app.
   - Find out the most popular Android OS in India.

5. Practical: Create and Start Activities
   - Create a new activity and layout
   - Start the new activity from an existing activity with an explicit intent
   - Pass user-entered information from one activity to the other.
6. Practical: Lifecycle and State Callbacks
   - Add Lifecycle callbacks
   - Save and restore instance state

7. Practical: Start Activities with Implicit Intents
    - Send an implicit intent to start an activity (open web site)
    - Send an implicit intent to start an activity (open location)
    - Use an intent filter to allow other apps to start an activity in your app
    - Use ShareCompat.IntentBuilder

8. Practical: Using the Debugger
9. Practical: Testing your code
10. Practical: Use support library
11. Practical: Use Keyboards, Input Controls, Alerts, and Pickers
    - Experiment in your app with different keyboards for user input, spelling suggestions, and auto-capitalization.
    - Add a spinner input control for selecting one value out of a set of values.
    - Create new app to show an alert, and record the user's selection (OK or Cancel). MOVE TO CONCEPT.
    - Update app to show date and time pickers and record the user's selections.

12. Practical: Use an Options Menu and Radio Buttons
13. Practical: Create a Recycler View
14. Practical: Theme, Custom Styles, Drawables
15. Practical: Add a FAB and Cards
16. Practical: Put yourself in the Users shoes
17. Practical: Implement Localized Strings
18. Practical: Use Espresso to test your UI
19. Practical: Create an AsyncTask
20. Practical: Google APIs Explorer, JSON, Books API
21. Practical: Use AsyncTaskLoader
22. Practical: BroadcastReceiver
23. Practical: Notifications
24. Practical: Alarm Manager
25. Practical: Job Scheduler
26. Practical: Firebase Job Dispatcher
27. Practical: Get and Save User Preferences
28. Practical: Save user data in a database
29. Practical: Querying and Searching a Database
30. Practical: Implement a Content Provider
31. Practical: Use a ContentResolver to query your data
32. Practical: Implement a Loader
33. Practical: Beta testing your app

Paper: 412 Subject: Python Programming

1. Write a Python program to get the Python version you are using.
2. Write a python program to display the current date and time.
3. Write a Python program which accepts the radius of a circle from the user and compute the area.
4. Write a Python program which accepts the user's first and last name and print them in reverse order with a space between them.
5. Write a Python program to accept a filename from the user print the extension of that.
6. Write a Python program to print the calendar of a given month and year.
7. Write a Python program to sum all the items in a list.
8. Write a Python program to print the numbers of a specified list after removing even numbers from it.
9. Write a Python program to find those numbers which are divisible by 7 and multiple of 5, between 1500 and 2700 (both included).
10. Write a Python program to count the number of even and odd numbers from a series of numbers.
11. Write a Python program to get the Fibonacci series between 0 to 50.
12. Write a Python program that prints all the numbers from 0 to 6 except 3 and 6.
    Note : Use 'continue' statement.
13. Write a Python program to print alphabet pattern 'X'.
14. Write a Python program that accepts a string and calculate the number of digits and letters.
15. Write a Python function to find the Max of three numbers.
16. Write a Python function that takes a number as a parameter and check the number is prime or not.
17. Write a Python function that checks whether a passed string is palindrome or not.
18. Write a Python script to sort (ascending and descending) a dictionary by value.
19. Write a Python script to check if a given key already exists in a dictionary.
20. Write a Python program to get the factorial of a non-negative integer.
21. Write a Python program to find the greatest common divisor (gcd) of two integers.
22. Write a Python program for binary search.
23. Write a Python program to sort a list of elements using the bubble sort algorithm.
24. Write a Python program to sort a list of elements using the selection sort algorithm.
25. Write a Python program to check that a string contains only a certain set of characters (in this case a-z, A-Z and 0-9).
26. Write a Python program to extract values between quotation marks of a string.
27. Write a Python program to extract values between quotation marks of a string.
28. Write a Python program to abbreviate 'Road' as 'Rd.' in a given string.
29. Write a Python program to check whether an alphabet is a vowel or consonant.
30. Write a Python program to check whether an alphabet is a vowel or consonant.

Paper: 412 Subject: Information Security

1. Implement Caesar cipher encryption-decryption
2. Implement Mono alphabetic cipher encryption- decryption.
3. Implement Play fair cipher encryption-decryption.
4. Implement Polyalphabetic cipher encryption-decryption.
5. Implement Hill cipher encryption-decryption.
6. To implement Simple DES or AES.
7. Implement RSA encryption-decryption algorithm.
8. Write a program to generate SHA-1 hash
9. Implement a digital signature algorithm.
10. Perform various encryption-decryption techniques with cryptool.