



## VIKRAMA SIMHAPURI UNIVERSITY NELLORE

### MINUTES OF THE BOARD OF STUDIES UG -COMPTER SCIENCE MEETING

Minutes of the meeting of the Board of Studies in UG-Computer Science held on 20.07.2022 & 21.07.2022 from 10.00 AM to 4.PM in the Department of Computer Science, Vikrama Simhapuri University, Nellore

Members:-






1	Dr. M. Ussenaiah Dept. of Computer Science, VSU College, Nellore	Chairman
2	Prof. Ande Prasad, PG BOS Chairman, V.S. University College, Nellore	Ex - Officio Member
3	Dr. G. Vijaya Lakshmi, Dept. of Computer Science, VSU College, Nellore, Phone No.6281501311	Subject Expert
4	Smt. B. Vidyulatha, Lecturer in Computer Science, D.K.W Govt. Degree College, Nellore Phone No.9849073645	Member
5	Smt.Md. Sameera, Lecturer in Computer Science, D.K.W Govt. Degree College, Nellore Phone No.8500618899	Member
6	Sri B. Pedda Narayana, Lecturer in Computer Science, Govt. Degree College, Udayagiri Phone No. 9494449771	Member
7	Sri. D. Nagabhusanam, Lecturer in Computer Science, Visvodaya Govt. Degree College, Venkatagiri Phone No. 8686768117	Member
8	Smt. K. Geetha, Lecturer in Computer Science, M.R.R Govt. Degree College, Udayagiri Phone No.8688180353	Member
9	Sri I. Siva Reddy, Lecturer in Computer Science, Govt. Degree College, Naidupet Phone No.9701647345	Member
10	Sri C.V.Pavan Kumar Lecturer in Computer Science Krishna Chaitanya Degree College, Nellore Phone:9441061085	Special Invitee



## Resolutions:

After examine the syllabus, the committee resolved the following:

1. The existing B.Sc. Computer Science & Information Technology first to fourth semester syllabus is modified **Annexure -1**
2. Skill Enhancement Courses of B.Sc. Computer Science & Information Technology syllabus is approved with modified as enclosed **Annexure -2**
3. Skill Enhancement Courses of B.Sc. Computer Applications syllabus is approved with modified as enclosed **Annexure -3**
4. Skill Enhancement Courses of the following BCA programmes syllabus is approved with modified as enclosed **Annexure 4**
  - a. Bachelor Computer Applications (General)
  - b. Bachelor Computer Applications (Data Science)
  - c. Bachelor Computer Applications (Data Science & Data Analytics)
  - d. Bachelor Computer Applications (Big Data & Machine Learning)
  - e. Bachelor Computer Applications (Artificial Intelligence & Data Science)
  - f. Bachelor Computer Applications (Cloud Computing & DevOps)

## Signatures of the presented Members

1	Dr. M. Ussenaiah Dept. of Computer Science, VSU College, Nellore	
2	Prof Ande Prasad PG BOS Chairman, V.S. University College, Nellore	
3	Dr. G. Vijaya Lakshmi, Dept. of Computer Science, VSU College, Nellore	
4	Smt. B. Vidyulatha, Lecturer in Computer Science, D.K.W Govt. Degree College, Nellore	
5	Smt.Md. Sameera, Lecturer in Computer Science, D.K.W Govt. Degree College, Nellore	
6	Sri B. Pedda Narayana, Lecturer in Computer Science, Govt. Degree College, Udayagiri	

7	Sri. D. Nagabhushanam, Lecturer in Computer Science, Visvodaya Govt. Degree College, Venkatagiri	
8	Smt. K. Geetha, Lecturer in Computer Science, M.R.R Govt. Degree College, Udayagiri	K. Geetha 21/07/2022
9	Sri I. Siva Reddy, Lecturer in Computer Science, Govt. Degree College, Naidupet	I. Siva Reddy
10	Sri C.V.Pavan Kumar Lecturer in Computer Science Krishna Chaitanya Degree College, Nellore	

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

REVISED UG SYLLABUS UNDER CBCS

(Implemented from Academic Year 2020-21)

PROGRAMME: FOUR YEAR B.Sc. (Hons)

Domain Subject: **Computer Applications for Sciences**

***Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)***

**Pair Options of SECs for Semester–V**

*(To choose one pair from the Five alternate pairs of SECs)*

Univ. Code	Course NO. 6&7	Name of Course*	Th. Hrs./ Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Mar- ks	Credits
	6A	Big data Analytics using R	3	25	75	3	3	50	2
	7A	Data Science using Python	3	25	75	3	3	50	2

OR

	6B	Mobile application development	3	25	75	3	3	50	2
	7B	Cyber security and malware analysis	3	25	75	3	3	50	2

OR

	6C	E– commerce application development	3	25	75	3	3	50	2
	7C	Real time governance system(RTGS)	3	25	75	3	3	50	2

OR

	6D	Multimedia Tools and Applications	3	25	75	3	3	50	2
	7D	Digital imaging	3	25	75	3	3	50	2

OR

	6E	Biological databases and applications	3	25	75	3	3	50	2
	7E	Essentials of Bioinformatics	3	25	75	3	3	50	2

\*(For Each Course: Maximum Marks: Theory: 100 + Practical: 50. Total hours: 90. Total Credits: 05)

**Note-1:** For Semester–V, for the domain subject Computer Applications, any one of the above five pairsof SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C& 7C or 6D & 7D or 6E & 7E. The pair shall not be broken (ABCDE allotment is random, not on any priority basis).

**Note-2:** One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill

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***Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)***

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*oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations.*

**Note-3:** *The courses are connected to the Computer Programming and the usage of software tools. The faculty members can follow the demo/illustration method of teaching. Hence, all the assigned 90 hours can be used as a whole to cover the entire theory as well as the laboratory/practical sessions.*

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Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

**Course-6A: BIGDATA ANALYTICS USING R**  
(Skill Enhancement Course (Elective), 5 credits)

**I. Learning Outcomes:**

Upon successful completion of the course, a student will be able to:

1. Understand data and classification of digital data.
2. Understand Big Data Analytics.
3. Load data in to R.
4. Organize data in the form of R objects and manipulate them as needed.
5. Perform analytics using R programming.

**II. Syllabus:** (Total Hours:90 including Theory, Practical, Skills Training, Unit tests etc.)

**Unit – 1: Introduction to Big data** (12 h)

Data, classification Of Digital Data--structured, unstructured, semi-structured data, characteristics of data, evaluation of big data, definition and challenges of big data , what is big data and why to use big data ?, business intelligence Vs big data.

**Unit – 2:Big data Analytics** (10 h)

What is and isn't bigdata analytics? Why hype around big data analytics? , classification of analytics, top challenges facing big data, importance of big data analytics, technologies needed to meet challenges of big data, data science, data scientist.

**Unit – 3: Introduction to R and getting started with R**(13h)

What is R?Why R? , advantages of R over other programming languages, Data types in R, logical, numeric, integer, character, double, complex, raw, coercion, ls() command, expressions, Variables and functions, control structures, Array, Matrix, Vectors, Factors, R packages.

**Unit – 4: Exploring data in R** (13h)

Data frames-data frame access, ordering data frames, R functions for data frames dim(), nrow(), ncol(), str(), summary(), names(), head(), tail(), edit(). Load data frames—reading from .CSV files, subsetting data frames, reading from tab separated value files, reading from tables, merging data frames.

**Unit – 5: Data Visualization using R** (12h)

**Reading and getting data into R (External Data):** Using CSV files, XML files, Web Data, Databases, Excel files.

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Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

**Working with R Charts and Graphs:** Histograms, Boxplots, Bar Charts, Line Graphs, Scatterplots, Pie Charts

**BOOKS**

1. Seema Acharya, Subhashini Chellappan --- Big Data And Analytics second edition, Wiley
2. Seema Acharya--Data Analytics using R, McGraw Hill education (India) Private Limited.
3. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Raj kamal, Preeti Saxena, McGraw Hill, 2018.
4. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, John Wiley & Sons, 2013

**Reference Books:**

1. An Introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics. W. N. Venables, D.M. Smith and the R Development Core Team

**RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

**B. General**

1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:** Some of the following suggested assessment methodologies could be adopted;

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(Implemented from Academic Year 2020-21)

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Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Problem-solving exercises,
4. Practical assignments and laboratory reports.
5. Observation of practical skills,
6. Individual and group project reports like “Creating Text Editor in C”.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work

**Course-6A: Big Data Analytics Using R; Lab (Practical) Syllabus**

1. Create a vector in R and perform operations on it.
2. Create integer, complex, logical, character data type objects in R and print their values and their class using print and class functions.
3. Write code in R to demonstrate sum (), min(), max() and seq() functions.
4. Write code in R to manipulate text in R using grep(), toupper(), tolower() and substr() functions.
5. Create a matrix of values in R and perform operations on it.
6. Create a list in R and perform operations on it.
7. Create data frame in R and perform operations on it.
8. Import data into R from text and excel files using read. Table () and read.csv () functions.
9. Write code in R to find out whether number is prime or not.
10. Print numbers from 1 to 100 using while loop and for loop in R.
11. Create a factor in R by specifying levels and print it then modify some values in it.
12. Write a program to import data from csv file and print the data on the console.
13. Write a program to demonstrate histogram in R



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(Implemented from Academic Year 2020-21)

PROGRAMME: FOUR YEAR B.Sc. (Hons)  
Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

A.P. State Council of Higher Education Semester-wise  
Revised Syllabus under CBCS, 2020-21 Four Year B.Sc.(Hons) -  
Semester – V (from 2022-23)

Subject: **Computer Applications for Sciences**

Course Code:

Max Marks: 100 + 50

**Course-7A: DATA SCIENCE USING PYTHON**  
(Skill Enhancement Course (Elective), 5 credits)

**Learning Outcomes:**

Upon successful completion of the course, a student will be able to:

1. Understand basic concepts of data science
2. Understand why python is a useful scripting language for developers.
3. Use standard programming constructs like selection and repetition.
4. Use aggregated data (list, tuple, and dictionary).
5. Implement functions and modules.

**II. Syllabus :**( Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**Unit – 1: Introduction to data science (10h)**

Data science and its importance, advantages of data science, the process of data science, Responsibilities of a data scientist, qualifications of data scientists, would you be a good datascientist, why to use python for data science.

**Unit – 2: Introduction to python (14h)**

What is python , features of python, history of python, writing and executing the python program, basic syntax, variables, keywords, data types ,operators ,indentation, Conditionalstatements-if, if-else, nested if-else, looping statements-for, while, nested loops, break, continue, pass

**Unit – 3: Control structures and strings (13h)**

**Strings** - definition, accessing, slicing and basic operations

**Lists** - introduction, accessing list, operations, working with lists, functions and methods,

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Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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**Tuples** - introduction, accessing tuple, operations.

**Dictionaries** - introduction, accessing values in dictionaries, working with dictionaries.

**Unit – 4: Functions and modules** **(12h)**

**Functions** - defining a function, calling a function, types of functions, function arguments, local and global variables, lambda and recursive functions, Modules- math, random, OS, date and time

**Unit – 5: Pandas** **(11h)**

What is Pandas? Series, Data Frame, Read CSV Files, Analyzing Data Frames, Data Correlations

**Data Cleaning:** Empty cells, Data in wrong format, Wrong data, Duplicates

**Pandas Plotting:** `plot ()` method, bar plot, hist plot, box plot, area plot, scatter plot, pie plot

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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**Reference Books:**

1. Steven cooper--- Data Science from Scratch, Kindle edition
2. Reemathareja—Python Programming using problem solving approach, OxfordPublication

**RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**C. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups a steams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

**D. General**

1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

11. The oral and written examinations (Scheduled and surprise tests),
12. Closed-book and open-book tests,
13. Problem-solving exercises,
14. Practical assignments and laboratory reports.
15. Observation of practical skills,
16. Individual and group project reports like “Creating Text Editor in C”.
17. Efficient delivery using seminar presentations,
18. Viva voce interviews.

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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19. Computerized adaptive testing, literature surveys and evaluations,
20. Peers and self-assessment, outputs form individual and collaborative work

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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**Course-7A: Data Science Using Python; Lab (Practical) Syllabus**

1. Python Program to Find the Square Root
2. Python Program to Swap Two Variables
3. Python Program to Generate a Random Number
4. Python Program to Check if a Number is Odd or Even
5. Python Program to Find the Largest Among Four Numbers
6. Python Program to Check Prime Number
7. Python Program to Display the multiplication Table
8. Python Program to Print the Fibonacci sequence
9. Python Program to Check Armstrong Number
10. Python Program to Find the Sum of Natural Numbers
11. Python Program to Make a Simple Calculator
12. Python Program to Find Factorial of Number Using Recursion
13. Python Program to Add Two Matrices
14. Python Program to Multiply Two Matrices
15. Python Program to Check Whether a String is Palindrome or Not
16. Python Program to create a dictionary and print its content.
17. Python program to import data from CSV file using pandas.
18. Python program to demonstrate bar plot

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(Implemented from Academic Year 2020-21)

PROGRAMME: FOUR YEAR B.Sc. (Hons)  
Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

A.P. State Council of Higher Education Semester-wise  
Revised Syllabus under CBCS, 2020-21

Course Code:

Subject: **Computer Applications for Sciences**  
Four Year B.Sc. (Hons) - Semester – V (from 2022-23)

Max Marks: 100 + 50

Course-**6B: MOBILE APPLICATION DEVELOPMENT**  
(Skill Enhancement Course (Elective), 5 credits)

**Learning Outcomes:**

Upon successful completion of the course, a student will be able to:

1. Identify basic terms ,tools and software related to android systems
2. Describe components of IDE, understand features of android development tools
3. Describe the layouts and controls
4. Explain the significance of displays using the given view
5. Explain the features of services and able to publish android Application
6. Developing interesting Android applications using MIT App Inventor

**Syllabus :**( Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**Unit-1:** **10 Hrs**

- 1.1 Introduction to Android ,open headset alliance, Android Ecosystem
- 1.2 Need of Android
- 1.3 Features of Android
- 1.4 Tools and software required for developing an Application
- 1.5 Android architecture

**Unit-2:** **12 Hrs**

- 2.1 operating system, java JDK, Android SDK
- 2.2 Android development tools
- 2.3 Android virtual devices
- 2.4 steps to install and configure Android studio and sdk

**Unit-3:** **14 Hrs**

- 3.1 control flow, directory structure
- 3.2 components of a screen

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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- 3.3 fundamental UI design
- 3.4 linear layout, absolute layout , table layout, relative layout
- 3.5 text view
- 3.6 edit text
- 3.7 button, image button, radio button, toggle button
- 3.8 radio group, check box, and progress bar
- 3.9 list view, grid view, image view, scroll view
- 3.10 time and date picker

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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**Unit-4:** **12 Hrs**

- 4.1 android platform services
- 4.2 Android system Architecture
- 4.3 Android Security model
- 4.4 Applications development: creating small application

**Unit-5 12 Hrs**

- 5.1 Introduction of MIT App Inventor
- 5.2 Application Coding 5.3 Programming Basics & Dialog
- 5.4 More Programming Basics
- 5.5 Alarm Clock Application
- 5.6 Audio & Video
- 5.7 Drawing Application
- 5.8 File
- 5.9 Game
- 5.10 Device Location
- 5.11 Web Browsing

**Text Books:**

1. Erik Hellman, “Android Programming – Pushing the Limits”, 1st Edition, Wiley India PvtLtd, 2014.
2. App Inventor: create your own Android apps by Wolber, David (David Wayne)

**Reference Books:**

1. Dawn Griffiths and David Griffiths, “Head First Android Development”, 1st Edition, O’Reilly SPD Publishers, 2015.
2. J F DiMarzio, “Beginning Android Programming with Android Studio”, 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
3. Anubhav Pradhan, Anil V Deshpande, “ Composing Mobile Apps” using Android, Wiley2014, ISBN: 978-81-265-4660-2
4. Android Online Developers Guide
5. <http://developer.android.com/reference/> Udacity: Developing Android
6. Apps- Fundamentals
7. <https://www.udacity.com/course/developing-android-appsfundamentals--ud853-nd>
8. <http://www.appinventor.mit.edu/>



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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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**RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**E. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

**General**

- a. Group Discussion
- b. Try to solve MCQ's available online.
- c. Others

**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Problem-solving exercises,
4. Practical assignments and laboratory reports.
5. Observation of practical skills,
6. Efficient delivery using seminar presentations,
7. Viva voce interviews.
8. Computerized adaptive testing, literature surveys and evaluations,
9. Peers and self-assessment, outputs form individual and collaborative work

**Course-6B: Mobile Application Development: Lab (Practical) Syllabus**

**Outcomes:**

1. Understand the android platform
2. Design and implementation of various mobile applications

**Experiments:**

1. Demonstrate mobile technologies and devices
2. Demonstrate Android platform and applications overview
3. Implement User interface design layouts
4. Working with texts , shapes, buttons and lists
5. Develop a calculator application

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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6. Implement an application that creates a alarm clock

**Note:** The list of experiments need not be restricted to the above list. *Detailed list of Programming/software tool based exercises can be prepared by the concerned faculty members.*

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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A.P. State Council of Higher Education Semester-wise  
Revised Syllabus under CBCS, 2020-21 Four-year B.Sc. (Hons) - V  
Semester (from 2022-23)

Course Code:

100 + 50

Max Marks:

Domain Subject: **Computer Applications for Sciences**

**Course-7B: CYBER SECURITY AND MALWARE ANALYSIS**  
(Skill Enhancement Course (Elective), 5 credits)

**COURSE OUTCOMES:**

Upon successful completion of this course, students should have the knowledge and skills to

1. Understand the computer networks, networking tools and cyber security
2. Learn about NIST Cyber Security Framework
3. Understand the OWASP Vulnerabilities
4. Implement various Malware analysis tools
5. Understand about Information Technology act 2000

**Syllabus:** (Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**UNIT 1: Introduction to Networks & cyber security**

**14hrs**

- Computer Network Basics
- Computer network types
- OSI Reference model
- TCP/IP Protocol suite
- Difference between OSI and TCP/IP
- What is cyber, cyber-crime and cyber-security
- All Layer wise attacks
- Networking devices: router, bridge, switch, server, firewall
- How to configure: router
- How to create LAN
- Network tools -

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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- ❖ IP scanner
- ❖ port scanner
- ❖ command tools-- net stack, trace route, lookup

**UNIT 2: NIST Cyber security framework 10hrs**

- Introduction to the components of the framework
- Cyber security Framework Tiers
- What is NIST Cyber security framework
- Features of NIST Cyber security framework
- Functions of NIST Cyber security framework

**UNIT 3: OWASP 14hrs**

- What is OWASP?
- OWASP Top 10 Vulnerabilities
  - ❖ Injection
  - ❖ Broken Authentication
  - ❖ Sensitive Data Exposure
  - ❖ XML External Entities (XXE)
  - ❖ Broken Access Control
  - ❖ Security Misconfiguration
  - ❖ Cross-Site Scripting (XSS)
  - ❖ Insecure Deserialization
  - ❖ Using Components with Known Vulnerabilities
  - ❖ Insufficient Logging and Monitoring
- OWASP Juice Shop
- Web application firewall

**UNIT 4: MALWARE ANALYSIS 12hrs**

- What is malware
- Types of malware
  - ❖ Key loggers
  - ❖ Trojans

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- ❖ Ran some ware
- Antivirus
- Firewalls
- Malware analysis
  - ❖ VM ware
  - ❖ How to use sandbox
  - ❖ Process explorer
  - ❖ Process monitor
- SOC-security operations controls - Solar winds (study the tools)
- Network intrusion detection
  - ❖ Wire shark
  - ❖ IDS
  - ❖ IPS
  - ❖ Snort

**UNIT 5: CYBER SECURITY: Legal Perspectives 10hrs**

- Cybercrime and the legal landscape around the world
- Indian IT ACT 2000 --Cybercrime and Punishments
- Weak areas of IT ACT 2000
- Challenges to Indian law and cybercrime scenario in India
- Amendments of the Indian IT Act

**Textbooks:**

1. Computer Networks | Fifth Edition | By Pearson (6th Edition) |Tanenbaum, Feamster &Wetherall
2. Computer Networking | A Top-Down Approach | Sixth Edition | By Pearson | KuroseJames F. Ross Keith W.
3. Cyber Security by Sunit Belapure, Nina Godbole|Wiley Publications
4. TCP/IP Protocol Suite |Mcgraw-hill| Forouzan| Fourth Edition

**Website References:**

- <https://csrc.nist.gov/Projects/cybersecurity-framework/nist-cybersecurity-framework-a-quick-start-guide>

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- <https://owasp.org/www-project-top-ten/>
- <https://owasp.org/www-project-juice-shop/>

**Co-Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

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4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

**B. General**

1. Group Discussion
2. Try to solve MCQ's available online.

**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Practical assignments and laboratory reports,
4. Observation of practical skills,
5. Individual and group project reports.
6. Efficient delivery using seminar presentations,
7. Viva-Voce interviews.
8. Computerized adaptive testing, literature surveys and evaluations,
9. Peers and self-assessment, outputs form individual and collaborative work

**Course-7B: Cyber Security and Malware Analysis; Lab (Practical) Syllabus**

**Learning Objectives:**

The purpose of this course is to impart practical understanding on Cyber security and protection of electronic systems and information from malware attacks.

1. Configure a LAN by using a switch
2. Configure a LAN by using Router
3. Steps to attack a victim computer by using "ProRat" Trojan tool
4. Perform the packet sniffing mechanism by download the "wire shark" tool and extract the packets
5. Perform the task of creating mail messages by using fake mail id by using the "fake mailer" website (<https://emkei.cz>)
6. Perform the IP scanning mechanism by using "tracert" and "arp" commands



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7. Perform the port scanning mechanism by using NMAP tool
8. Perform an SQL Injection attack and its preventive measure to avoid Injection attack
9. Perform an activity to access a locked computer without knowing the user's password.

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Semester (from 2022-23)

Course Code:

100 + 50

Max Marks:

Domain Subject: **Computer Applications for Sciences**

IV Year B. Sc./B.Com, – Semester – V

Course-6C: **E– Commerce Application Development**

(Skill Enhancement Course (Elective), 5 credits)

**Learning Outcomes:**

Upon successful completion of the course, a student will be able to:

1. To apply in an integrative and summative fashion the students' knowledge in all fields of business studies by drafting a website presence plan.
2. To understand the factors needed in order to be a successful in ecommerce
3. To gain the skills to bring together knowledge gathered about the different components of building a web presence
4. To critically think about problems and issues that might pop up during the establishment of the web presence
5. To apply Word Press as a content management system (CMS), Plan their website by choosing colour schemes, fonts, layouts, and more

**Syllabus:**(Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**Unit-1 :( 10h)**

- 1.1 Introduction to E– commerce:
- 1.2 Meaning and concept – E– commerce
- 1.3 E– commerce v/s Traditional Commerce
- 1.4 E– Business & E– Commerce – History of E– Commerce
- 1.5 EDI – Importance, features & benefits of E– Commerce
- 1.6 Impacts, Challenges & Limitations of E– Commerce

**Unit-2:**

**(12h)**

- 2.1 Business models of E – Commerce: Business to Business
  - 2.1.2 Business to customers
  - 2.1.3 Customers to Customers
  - 2.1.4 Business to Government

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- 2.1.5 Business to Employee
- 2.2 E – Commerce strategy
- 2.3 Influencing factors of successful E– Commerce
- 2.4 Architectural framework for Electronic Commerce, Web based E Commerce

**Unit-3:** (12h)

- 3.1 Electronic Data Interchange (EDI): Definitions: Examples
- 3.2 EDI Technology
- 3.3 EDI- Communications
- 3.4 Implementation
- 3.5 EDI Agreements –
- 3.6 Security Purchasing Online
- 3.7 E– Commerce payment system.
- 3.8 Digital Economy

**Unit -4: (14h)**

- 4.1 Java Script- Introduction, Control Structures, Arrays, Strings and Objects
- 4.2 PHP- Introduction, Control Structures, Arrays, Strings and Objects
- 4.3 The elements of e-commerce: Internet e-commerce security
- 4.4 A web site Evaluation Model

**Unit-5: (12h)**

- 5.1 Logging in to Your Word press Site
- 5.2 word press dash board
- 5.3 creating your first post
- 5.4 adding photos and images
- 5.5 creating hyper link
- 5.6 adding categories and tags
- 5.7 changing your theme
- 5.8 editing an existing post
- 5.9 usage of E-commerce plug-in such as Woo Commerce

**Textbooks:**

1. Turban, Rainer, and Potter, Introduction to E-Commerce, second edition, 2003
2. H. M. Deitel, P. J. Deitel and T. R. Nieto, E-Business and E-Commerce: How toPrograme, Prentice hall, 2001

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3. WordPress All-in-One For Dummies -written by Lisa Sabin Wilson with contributions by Michael Torbert, Andrea Rennick, Cory Miller, and Kevin Palmer

**Reference Books:**

1. Elias. M. Awad, "Electronic Commerce", Prentice-Hall of India Pvt Ltd.
2. RaviKalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley
3. <https://w3cschools.com>
4. David Whiteley, E-Commerce: Strategy, Technologies and Applications, Tata McGrawHill.

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**RECOMMENDED CO-CURRICULAR ACTIVITIES:** (Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

**B. General**

1. Group Discussion
2. Others

**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Efficient delivery using seminar presentations,
4. Computerized adaptive testing, literature surveys and evaluations,
5. Peers and self-assessment, outputs form individual and collaborative work

**Course-6C: E- Commerce Application Development; Lab (Practical)  
Syllabus**

Case study of e-commerce

1. Home page design of web site
2. Validation using PHP
3. Implement Catalog design
4. Implement Access control mechanism( eg: username and password)
5. Implement Session management (php session management)
6. Implement Shopping cart
7. Case study on business model of bookstore

**Note:** The list of experiments need not be restricted to the above list. *Detailed list*

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*of Programming/software tool based exercises can be prepared by the concerned faculty members.*

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Semester (from 2022-23)

Course Code:

Max Marks: 100

+ 50

Domain Subject: **Computer Applications for Sciences**

**Course-7C: REAL TIME GOVERNANCE SYSTEM (RTGS)**  
(Skill Enhancement Course (Elective), 5 credits)

**COURSE OUTCOMES:**

Upon successful completion of this course, students will have the knowledge and skills to

1. Understand the terms regarding Governance, E-Governance and RTGS
2. Learn about E-Governance Infrastructure
3. Understand the E-Governance implementation in several countries
4. Understand the E-Governance implementation in several Indian states
5. Understand the applications of RTG

**Syllabus:** (Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**UNIT 1: Introduction to E-Governance**

**12hrs**

- Government, Governance and Good Governance
- What is E-Governance or Electronic Governance?
- E-Government and E-Governance: A conceptual Analysis
  - ❖ Objectives
  - ❖ Components
  - ❖ application domains
  - ❖ four phase model
  - ❖ implementing E-Governance
  - ❖ issues while implementing E-Governance
  - ❖ Opportunities and challenges
- Types of E-Governance
- What is Real-Time Governance (RTG)
- Real Time Governance Society (RTGS)

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**UNIT 2: E-Governance Infrastructure**

**15hrs**

- Data Systems infrastructure
  - ❖ Executive Information Systems
  - ❖ Management Information Systems
  - ❖ Knowledge Management Systems
  - ❖ Transaction Processing Systems



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- Legal Infrastructural preparedness
  - ❖ IT Act 2000
  - ❖ Challenges to Indian law and cybercrime scenario in India
  - ❖ Amendments of the Indian IT Act
- Institutional Infrastructural preparedness
  - ❖ Internet
  - ❖ intranet
  - ❖ extranet
- Human Infrastructural preparedness
  - ❖ Top-level management
  - ❖ Middle-level management
  - ❖ Low-level management
  - ❖ Human Resource Management System
- Technological Infrastructural preparedness
  - ❖ Information and communications technology
  - ❖ Data Warehousing
  - ❖ Cloud Computing
  - ❖ Data Farms

**UNIT 3: E-Governance: Country Experience**

**11hrs**

- INDIA
- US
- UK
- AUSTRALIA
- NEW ZELAND
- DUBAI

**UNIT 4: E-Governance in India**

**11hrs**

- Andhra Pradesh
- Telangana
- Karnataka
- Kerala
- Uttar Pradesh

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- Madhya Pradesh
- West Bengal
- Gujarat

**UNIT 5: Latest Applications in Real Time Governance** **(11h)**

- Agriculture
- Rural Development
- Health care
- Education
- Tourism
- Commerce and Trade

**Textbooks:**

1. E-Governance: concepts and case studies| CSR Prabhu| Prentice-Hall|
2. E-Governance| Niranjani, Sanhari Mishra | Himalaya Publishing House

**Website References:**

1. <http://www.egov4dev.org/success/case/>
2. <https://vikaspedia.in/e-governance/resources-for-vles>
3. <https://altametrics.com/en/information-systems/information-system-types.html>
4. <https://core.ap.gov.in/CMDashBoard/Index.aspx>

**Co-Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of

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students shall be ensured (team activity)

**B. General**

1. Group Discussion
2. Try to solve MCQ's available online.

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**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

**Some of the following suggested assessment methodologies could be adopted;**

10. The oral and written examinations (Scheduled and surprise tests),
11. Closed-book and open-book tests,
12. Practical assignments and laboratory reports,
13. Observation of practical skills,
14. Individual and group project reports.
15. Efficient delivery using seminar presentations,
16. Viva-Voce interviews.
17. Computerized adaptive testing, literature surveys and evaluations,
18. Peers and self-assessment, outputs form individual and collaborative work

**Course-7C: Real Time Governance System (RTGS); Lab (Practical)  
Syllabus**

**Note:** Here the students have to gather the details in computer lab by surfing several websites & Google search engines and submit the report to the class/lab instructor before leaving the lab.

Week 1: Write a Report on the role of Nationwide Networking in E-Governance  
Week 2: Write a Report on SETU: A Citizen Facilitation Centre in India, regarding its successful or failure journey.

Week 3: Write a Report on National Cyber Security Policy, how it is useful to Indian citizens.  
Week 4: Write a Report on mee-seva/Village Secretariat/Ward secretariat, a new paradigm in citizen services.

Week 5: Write a Report on any “State Data Centre (SDC)”: Regarding the features, key applications, etc.

Week 6: Write a Report on how Andhra Pradesh is implementing RTGS in Agriculture.

Week 7: Write a Report on how Andhra Pradesh is implementing RTGS in social welfare schemes

Week 8: Write a Report on how Andhra Pradesh is implementing RTGS in waste lands, agricultural lands and house properties.

Week 9: Write a Report on Electronic Birth Registration in any of the four states of our country.  
Week 10: Write a detailed report on “types of e-governance” with real-life implementation in

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India with suitable examples.

Week 11: Write a detailed report on “types of computer networks” available to implement RTGS.

Week 12: Write a detailed report on ICT concept and its usage in schools and college education.

**Website References:**

- <http://www.egov4dev.org/success/case/>

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Learning Outcomes:

**Course-6D: Multimedia Tools and Applications**  
(Skill Enhancement Course (Elective), 5 credits)

Upon successful completion of the course, a student will be able to:

1. Gain knowledge on the concepts related to Multimedia.
2. Understand the concepts like image data representation and color modes.
3. Understand the different types of video signals and digital audio.
4. Know about multimedia data compression types and audio compression standards
5. Know about basic video compression techniques.

**Syllabus:** (Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**Unit-1: Introduction to multimedia:** **12Hr**

1. What is Multimedia?
2. Components of Multimedia System
3. Multimedia and Hypermedia
4. Multimedia Authoring metaphors
5. Multimedia Production
6. Multimedia Presentation
7. Automatic Authoring

**Unit-2: Image Data Representations and color models:** **12Hr**

1. Color science Human vision Image data types:
2. 2.Black & white images
  - 2.1 1-bit images (Binary image)
  - 2.2 8-bit (Gray -level images)
3. Color images
  - 3.1 24-bit color images
  - 3.2 8-bit color images
4. Color models

**Unit-3: Fundamental concepts in video:** **12Hr**

1. Types of Video Signals

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1.1 Analog Video

1.2 Digital Video

**Basics of Digital Audio:**

2. What is Sound?

2.1 Digitization of Sound

2.2 Quantization and Transmission of Audio

2.2.1 Pulse code modulation

2.2.2 Differential coding of audio

2.2.3 Predictive coding

2.2.4 DPCM

**Unit-4:**

**Multimedia Data Compression:**

**12Hr**

1. Introduction

1.1 Basics of Information Theory

1.2 Lossless Compression Algorithms

1.2.1 Fix-Length Coding

1.2.2 Run-length coding

1.2.3 Differential coding

1.2.4 Dictionary-based coding

1.3. Variable Length Coding

1.3.1 Shannon-Fano Algorithm

1.3.2 Huffman Coding Algorithm

**Audio Compression standards:**

2. Introduction

2.1 Psychoacoustics model

2.2 MPEG Audio

**Unit-5: Basic Video Compression Techniques:**

**12Hr**

1. Introduction to Video compression

2. Video Compression with Motion Compensation

3. Video compression standard H.261

4. Video compression standard MPEG-1

**Text Books:**

Fundamentals of Multimedia by Ze-Nian Li & Mark S. Drew. Publisher: Prentice Hall

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**Reference Books:**

1. An introduction to digital multimedia by Savage, T. M. and Vogel, K. E. 2008.
2. Digital Multimedia by Nigel Chapman & Jenny Chapman. 2009. **Online Resources:**  
<https://ksuit342.wordpress.com/lectuers/> <https://www.tutorialspoint.com/multimedia>



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**Recommended Co-Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
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4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

**B. General**

1. Group Discussion
2. Others

**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Observation of practical skills,
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs form individual and collaborative work

**Suggested Software**

- 1) Image Editing – GIMP
- 2) Audio Editing – Audacity
- 3) Video Editing – video pad
- 4) NCH software tools.

**Course-6D: Multimedia Tools and Applications; Lab (Practical) Syllabus**

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1. Editing images using GIMP
2. Improve the Quality of your Image in GIMP
3. Introduction to Layer Masks. Au
4. Create an impressive background in GIMP
5. Applying Shadow & Highlight effects in images
6. Black& white and color photo conversion.
8. Using File Seizer Software for Audio compression.
9. Using File seizer Software for Video compression.

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PROGRAMME: FOUR YEAR B.Sc. (Hons)  
Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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Course-7D: **DIGITAL IMAGING**  
(Skill Enhancement Course (Elective), 5 credits)

Learning Outcomes: Upon successful completion of the course, a student will be able to:

1. Gain knowledge about Types of Graphics, Types of Objects, Types of video editing tools
2. Show their skills in editing and altering photographs for through abasic understanding of the tool box.
3. Gain knowledge in using the layers.
4. Gain knowledge in using the selection tools, repair tools.
5. Gain knowledge in using selection tools, applying filters and can show their skills.

**Syllabus:** (Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**UNIT-I 12 Hrs**

1. Types of Graphics
  - 1.1 Raster vs Vector Graphics
2. Types of Objects
  - 2.1 Audio formats
  - 2.2 Video formats
  - 2.3 Image formats
  - 2.4 Text document formats
3. Types of video editing
4. Different color modes.
5. Image Scanner
  - 5.1 Types of Image Scanners

**UNIT-II 12 Hrs**

1. What is GIMP?
2. GIMP tool box window
3. Layers Dialog
4. Tool Options Dialog
5. Image window
6. Image window menus

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**UNIT-III 12 Hrs**

**Improving Digital Photos**

- 1.1 Opening files
  - 1.1.1 Rescaling saving files
- 1.2. Cropping
- 1.3. Brightening & Darkening
- 1.4. Rotating
- 1.5. Sharpening
- 1.6. Fixing Red Eye

**Introduction to layers**

2. What is layer?
  - 2.1. Using layer to add text
  - 2.2. Using move tool
  - 2.3. Changing colors
  - 2.4. Simple effects on layers
  - 2.5 Linking layers together
  - 2.6 Performing operations on layers
  - 2.7 Using layers to copy and paste
  - 2.8 Tour of layers dialog

**UNIT-IV 12 Hrs**

**Drawing:**

- 1.1 Drawing lines and curves
- 1.2 Changing colors and brushes
- 1.3 Erasing
- 1.4 Drawing rectangles
- 1.5 Circles and other shapes
- 1.6 Outlining and filling regions
- 1.7 Filling with patterns and gradients
- 1.8 Importing brushes or gradients or making your own.

**Selection:**

- 2.1 Working with selections
- 2.2 Select by color and fuzzy
- 2.3 Select Bezier paths

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- 2.4 Intelligent scissors tool
- 2.5 Modifying selections with selection modes

**UNIT-V 12 Hrs**

**Erasing and Touching Up:**

- 1.1 Dodge and burn tool
- 1.2 Smudging tool
- 1.3 Clone tool
- 1.4 Sharpening using convolve tool
- 1.5 Blurring with Gaussian Blur
- 1.6 Correcting Color Balance
- 1.7 Hue
- 1.8 Saturation
- 1.9 Color balance using curves and levels.

**Filters:**

- 2.1 Filters
  - 2.1.1 Blur
  - 2.1.2 Enhance
  - 2.1.3 Distort
  - 2.1.4 Noise Filters

**References:**

Textbook: Beginning GIMP from Novice to professional by Akkana Peck, Second Edition, A press

**Recommended Co-Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**A. Measurable**

- 1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
- 2. Student seminars (on topics of the syllabus and related aspects (individual activity))
- 3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

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4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

**B. General**

1. Group Discussion
2. Others

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**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Observation of practical skills,
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs form individual and collaborative work

**Course-7D: DIGITAL IMAGING; Lab (Practical) Syllabus**

1. Designing a Visiting card
2. Design Cover page of a book
3. Paper add for calling tenders
4. Passport photo design
5. Design a Pamphlet
6. Brochure designing
7. Titles designing
8. Custom shapes creation
9. Black & white and color photo conversion
10. Image size modification
11. Background changes
12. Texture and patterns designing
13. Filter effects & Eraser effects

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*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

A.P. State Council of Higher Education Semester-wise  
Revised Syllabus under CBCS, 2020-21  
Four-year B.Sc. (Hons) Semester-5 (from 2022-23)

Course Code:

+ 50

Max Marks: 100

Domain Subject: **Computer Applications for Sciences**

Course-**6E: BIOLOGICAL DATABASES AND APPLICATIONS**  
(Skill Enhancement Course (Elective), 5 credits)

**Learning Outcomes:**

Upon successful completion of the course, a student will be able to:

1. To provide a system level understanding of interactions of computers with biological systems.
2. To model the biological macromolecular structures and structure prediction methods
3. To gain knowledge about the methods to characterize and manage different types of biological data

**II. Syllabus :** ( Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**Unit – 1:** Basic concept of open access bibliographic resources related to life sciences, the Significances and the need for such resources, the major content of the databases,

how to search and use these resources/databases with special references to PubMed. (12 h)

**Unit – 2:** (10 h)  
Contents and formats of databases entries, retrieval of data using text based search Using ENTREZ, sources of data, method for deposition of data to databases.

**Unit – 3:** (12 h)  
Nucleic acid sequence databases, GenBank, EMBL, DDBJ. Protein Sequence Databases:



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PROGRAMME: FOUR YEAR B.Sc. (Hons)  
Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

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SWISSPROT, Tr-EMBL, PIR-PSD, Genome Databases at NCBI, EBI, TIGR, SANGER.

**Unit – 4:** (12 h)  
Secondary Structure Prediction of Protein, Tertiary Structure Prediction of  
Protein, Bioinformatics Perspectives on Human Diseases, Markov and Hidden Markov  
Models

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Domain Subject: **Computer Applications for Sciences**

*Skill Enhancement Courses (SECs) for Semester V, from 2022-23 (Syllabus/Curriculum)*

**Unit – 5:** (14 h)  
Machine Learning Techniques, Algorithms and techniques for Microarray analysis,  
Medical Informatics, Bioinformatics & systems biology

**Textbooks:**

1. Introduction to Bioinformatics – Attwood & Parry-Smith, Pearson Education.
2. Bioinformatics-Methods and applications, Rastogi, S.C.Mendiratta, N. and Rastogi P

**Reference Books:**

1. Introduction to Bioinformatics – Attwood & Parry-Smith, Pearson Education
2. Bioinformatics- A beginner's guide by Jean-Michel Claverie, John Wiley & Sons.
3. Structural Bioinformatics by Philip E. Bourne and Helge Weissing, Wiley
4. Bioinformatics-Methods and applications, Rastogi, S.C.Mendiratta, N. and Rastogi P, Prentice-Hall of India Pvt. Ltd, New Delhi
5. Essential Bioinformatics-Jin Xiong, Cambridge University Press
6. Bioinformatics – Sequence and Genome analysis, Mount DW, Cold Spring Harbour Laboratory Press, New York
7. Bioinformatics - Baxevanis AD & Quellerie BFF, John Wiley & Sons Inc.

**Reference Links**

1. [https://www.nature.com/articles/ng1199supp\\_84b](https://www.nature.com/articles/ng1199supp_84b)
2. <https://www.coursera.org/learn/machine-learning>

**RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**F. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and

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data (Individuals or groups a steams))

4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

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**G. General**

1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

21. The oral and written examinations (Scheduled and surprise tests),
22. Closed-book and open-book tests,
23. Problem-solving exercises,
24. Practical assignments and laboratory reports.
25. Observation of practical skills,
26. Individual and group project reports like "Creating Text Editor in C".
27. Efficient delivery using seminar presentations,
28. Viva voce interviews.
29. Computerized adaptive testing, literature surveys and evaluations,
30. Peers and self-assessment, outputs form individual and collaborative work

**Course-6E: Biological Databases and Applications; Lab (Practical) Syllabus**

1. Information retrieval from NCBI
2. Demonstration on the possible usage of Gene databases
3. Demonstration of structure and applications of Protein databases
4. Demonstration on sequence alignment (pair wise) using any biological database
5. Demonstration on sequence alignment (MSA) using any biological database
6. Demonstration of various functions/applications on biological databases using BLASTtool.

**Note:** The list of experiments need not be restricted to the above list. *Detailed list of Programming/software tool based exercises can be prepared by the concerned faculty members.*

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Domain Subject: **Computer Applications for Sciences**

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A.P. State Council of Higher Education Semester-wise  
Revised Syllabus under CBCS, 2020-21 Four-year B.Sc. (Hons)  
Semester – V (from 2022-23)  
Subject: **Computer Science for Sciences**

Course Code:

100 + 50

Max Marks:

Course-**7E: ESSENTIALS OF BIO INFORMATICS**  
(Skill Enhancement Course (Elective), 5 credits)

**Learning Outcomes:**

Upon successful completion of the course, a student will be able to:

1. To get the basic knowledge on the concepts of Bioinformatics and its significance in Biological data analysis.
2. To know the methods to characterise and manage the different types of Biological data.
3. To get insight into the basics of sequence alignment and analysis.
4. To get overview about biological macromolecular structures and structure prediction methods.

**II. Syllabus :** ( Total Hours: 90 including Theory, Practical, Skills Training, Unit tests etc.)

**Unit – 1:** (12 h)

Introduction: What is Bioinformatics, Goal, Scope, Applications and Limitations  
Introduction to Biological Databases: What is a Database, types of Databases, biological databases, pitfalls of biological databases, information Retrieval from biological data bases.

**Unit – 2:** (12 h)

Pairwise sequence Alignment-Evolutionary basis, sequence homology versus sequence similarity, sequence similarity versus sequence identity, Global and local alignment methods, scoring matrices, statistical significance of sequence alignment

**Unit – 3:** (14 h)

Database similarity searching- Unique requirements of database searching,

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heuristic database searching, Basic Local Alignment Search Tool (BLAST), FASTA, comparison of FASTA and BLAST, database searching with Smith-Waterman Method.

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**Unit – 4:** (10 h)

Multiple sequence alignments- clustal-w, Homology modeling, phylogenetic tree construction, applications of sequence alignments.

**Unit – 5:** (12 h)

Gene Prediction- Categories of Gene Prediction programs, Gene Prediction in Prokaryotes, Gene Prediction in Eukaryotes, Protein structure basis-Amino Acids, Secondary Structures, Tertiary Structures, Protein Structure database.

**Textbooks:**

1. Essential Bioinformatics-Jinxing, Cambridge University Press

**Books for Reference:**

1. Introduction to Bioinformatics – Attwood & Parry-Smith, Pearson Education.
2. Bioinformatics-Methods and applications, Rastogi,S.C. Mendiratta, N. and Rastogi
3. F. Crick, “Central dogma of molecular biology,” *Nature*, vol. 227 pp. 561-563,1970.
4. P. K. Gupta, “Cell and molecular biology,” 5<sup>th</sup> Edition, *Rastogi Publications*, 2005.
5. J. D. Watson, A. B. Tania, P. B. Stephen, G. Alexander, L. Michael, and L. Richard, “Molecular biology of the gene,” 7<sup>th</sup> Ed, *Pearson Education*, 2017

**RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

**H. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
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4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

**I. General**

1. Group Discussion
2. Try to solve MCQ's available online.
3. Others



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**RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

31. The oral and written examinations (Scheduled and surprise tests),
32. Closed-book and open-book tests,
33. Problem-solving exercises,
34. Practical assignments and laboratory reports.
35. Observation of practical skills,
36. Individual and group project reports like “Creating Text Editor in C”.
37. Efficient delivery using seminar presentations,
38. Viva voce interviews.
39. Computerized adaptive testing, literature surveys and evaluations,
40. Peers and self-assessment, outputs form individual and collaborative work

**Course-7E: Essentials of Bioinformatics; Lab (Practical) Syllabus**

1. Demonstration of various functional features of NCBI web page
2. Demonstration on sequence retrieval of a given Gene
3. Demonstration on sequence retrieval of a known Protein
4. Demonstration on sequence alignment of given two sequences.
5. Homology prediction using BLAST
6. Phylogenetic tree construction
7. Protein 2<sup>o</sup> (secondary) structure prediction by UniProt.

**Note:** The list of experiments need not be restricted to the above list. *Detailed list of Programming/software tool-based exercises can be prepared by the concerned faculty members.*

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*Draft Syllabus prepared by:*

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