GOVERNMENT DEGREE COLLEGE FOR WOMEN, BEGUMPET
(AUTONOMOUS)

CHOICE BASED CREDIT SYSTEM (CBCS)

SYLLABUS
For
B.Sc.(Data Science) II Year

Under Graduate Programme

DEPARTMENT OF COMPUTERS
(w.e.f. 2021 - 22 Session)

GOVERNMENT DEGREE COLLEGE FOR WOMEN
(AUTONOMOUS)
BEGUMPET, HYDERABAD
DEPARTMENT OF COMPUTERS
ALLOCATION OF CREDITS FOR B.Sc.(Data Science)

Course Title	Course Type	Hours per Week	Credits
SEMESTER – I			
Fundamentals of Information Technology	**DSC-A**	**4T+2P**	**4+1=5**
SEMESTER – II			
Problem solving and Python Programming	**DSC-B**	**4T+2P**	**4+1=5**
AECC			
Fundamentals of Computers	**AECC**	**2T**	**2**
SEMESTER – III			
Communication Skills(or) Professional Skills–I)	**SEC-1**	**2T**	**2**
Operating Systems – 1	**SEC – 2**	**2T**	**2**
Data Engineering with Python	**DSC-C**	**4T+2P**	**4+1=5**
SEMESTER – IV			
Leadership & Management Skill (or)Universal Human Values	**SEC - 3**	**2T**	**2**
Operating Systems – 2	**SEC – 4**	**2T**	**2**
Machine Learning	**DSC-D**	**4T+2P**	**4+1=5**
SEMESTER – V			
Data Structures and Algorithms	**GE**	**4T**	**4**
Natural Language Processing	**DSE- A**	**4T+2P**	**4+1=5**
No SQL Data Bases	**DSE- A**	**4T+2P**	**4+1=5**
SEMESTER – VI			
Big Data	**DSE–B**	**4T+2P**	**4+1=5**
Deep Learning	**DSE–B**	**4T+2P**	**4+1=5**
Project			
Project	**Project**	**4**	**4**
	Total Number of Credits		**48**

GOVERNMENT DEGREE COLLEGE FOR WOMEN

(AUTONOMOUS)

BEGUMPET, HYDERABAD

DEPARTMENT OF COMPUTER SCIENCE

Programme Outcomes

PO 1 Domain Expertise:
- Acquire comprehensive knowledge and skills.
- Make use of the knowledge in an innovative manner.
- Effectively apply the knowledge and skills to address various issues.
.
PO 2 Modern equipment Usage
- Use ICT effectively.
- Access, retrieve and use authenticated information.
- Access, retrieve and use authenticated information. Have knowledge of software applications to analyze data.

PO 3 Computing Skills and Ethics
- Develop rationale and scientific thinking process.
- Use technology intelligently for communication, entertainment and for the benefit of mankind.
- Ensure ethical practices throughout ones endeavors for the wellbeing of human race.

PO 4 Complex problem Investigation & Solving
- Predict and analyze problems.
- Frame hypotheses.
- Investigate and interpret empirical data.
- Plan and execute action.

PO 5 Perform effectively as Individuals and in Teams
- Work efficiently as an individual
- Cooperate, coordinate and perform effectively in diverse teams/groups.
- Prioritize common interest to individual interest.

PO 6 Efficient Communication & Life Skills
- Express thoughts in an effective manner
- Listen, understand and project views in a convincing manner.
- Decide appropriate media to share information
- Develop skills to present significant information clearly and concisely to interested groups.

PO 7 Environmental Sustainability
- Understand sensibly the Environmental challenges.
- Think critically on environment sustainability measures.
- Propagate and follow environment friendly practices.

PO 8 Societal contribution
- Render service for the general good of the society.
- Involve voluntarily in social development activities at Regional, National, global levels.
- Have own pride in volunteering to address societal issues viz: calamities, disasters, poverty, epidemics.
- Be a patriotic citizen to uphold the values of the nation

PO 9 Effective Project Management
- Identify the goals, objectives and components of a project and decide the appropriate time of completion.
- Plan, organize and direct the endeavors of teams to achieve the set targets in time.
- Be competent in identifying opportunities and develop strategies for contingencies.

DEPARTMENT OF COMPUTERS
BOARD OF STUDIES MEETING FOR THE YEAR 2021-2022

The 11[nth]meeting of the Board of studies of the Department of Computers Government Degree College for Women, Begumpet, Hyderabad was held on _____ in the Department of Computers, Govt. Degree College for Women, Begumpet, Hyderabad.

The following members were present:

SL.No	NAME	ADDRESS
1.	<u>University Nominee</u> Dr.C. Goverdhan M.Sc, Ph.D.	Chairman, Board of Studies, Department of Mathematics, Osmania University, Hyderabad. Mobile No:9440130036
2.	<u>Subject Expert</u> Mr.A.Inna Reddy MCA,UGC NET,(Ph.D)	Associate Professor Department of Computer Application GDC Chanchalguda Mobile no:9949197994 innareddyallam@gmail.com
4.	<u>Subject Expert</u> Dr. T.R.Srinivas B.E,M.Tech,M.B.A,PhD	Associate Professor Department of Computer Science and Engineering AAR Mahaveer Engineering College Mobile no:8143341367 cshod@aarm.ac.in
5.	<u>Industralist</u> Mr.C.Chinna Swamy Team Leader	Company Name:Pantech e Learning Mobile:8925533482
6.	<u>In charge of the Department – Chairman, BOS – Computers</u> Dr.D.Sarada Devi	Associate Professor in Mathematics Department of Mathematics, Government Degree college for women, Begumpet, Hyderabad. Mobile:9848190810
7.	<u>Faculty – Member</u> Smt.P.Kalpana M.Sc (Computer Science)	Lecturer in Computer Applications, Government Degree College for Women, Begumpet, Hyderabad. Mobile: 9030122738
8.	<u>Faculty – Member</u> Ms.G.T.Jayalaxmi M.C.A	Lecturer in Computer Applications, Government Degree College for Women, Begumpet, Hyderabad. Mobile: 7396923294
9.	<u>Faculty – Member</u> Ms.A.Laxmi Prasanna M.Tech(CSE)	Lecturer in Computer Science, Government Degree College for Women, Begumpet, Hyderabad. Mobile: 9160848766

10.	Faculty – Member K.Ankitha M.Tech(CSE)	Lecturer in Computer Science, Government Degree College for Women, Begumpet, Hyderabad. Mobile: 9381453216
11.	Faculty – Member Ms.M.Sandhya M.Tech(CSE)	Lecturer in Computer Science, Government Degree College for Women, Begumpet, Hyderabad. Mobile: 8712180180
12.	Faculty-Members Ms.R.Swapna M.Sc (Computer Science)	Lecturer in Computer Science, Government Degree College for Women, Begumpet, Hyderabad. Mobile:9985509476
13.	Faculty – Member Ms.P.Vamshipriyadarshini M.Tech	Lecturer in Computer Science, Government Degree College for Women, Begumpet, Hyderabad. Mobile: 9391812746

SYLLABUS

B.Sc. (Data Science) II YEAR

(With effect from batch of students admitted from the academic year
2021 -2022 onwards under semester system)

GOVERNMENTDEGREECOLLEGE FOR WOMEN,
BEGUMPET, HYDERABAD

(Autonomous)
Affiliated to OsmaniaUniversity

GOVERNMENT DEGREE COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD – 16
(An Autonomous college of Osmania University)
Re-Accredited by NAAC with 'B+' Grade

DEPARTMENT OF COMPUTERS
PATTERN OF EXAMINATION
Question Paper pattern for Internal, Theory and Practical Examinations of B.Sc (CS) I Year, Semester I & II

Internal Assessment
1. 40 marks are allotted for the Internal Assessment.
2. Two Internals of 20 marks each.
3. Internals shall be held at the end of every 9th week and 14th week of the Semesters.
4. The Time duration for the Internal Assessment shall be 1 hour.
5. Internals consists of
   Section – A: 2 out of 4 questions –each question carries 5marks   2x5=10 marks.
             B: 1 out of 2 questions – carries   10marks   1x10=10 marks.
                                                        Total=20 marks
6. 5 marks will be allotted for the Assignment.
7. 5marks will be allotted for Seminar.
8. 10 marks will be allotted for Multiple Choice Questions(MCQS)
   4 MCQS will be conducted from 4 units . An average of 4 MCQs will be calculated as MCQS Marks

Semester Examination
1. 60 marks are allotted for the main Exam for each Semester to be held in the month of October and March/April months.
2. The Time duration for the External Assessment shall be 2 ½ hours.
3. Section – A : 5 out of 8 questions –each question carries 4marks   5x4=20 marks
   Section – B : 4 out of 8 questions –each question carries 10marks   4x10=40 marks
                                                        Total=60 marks

Practical Examinations
1. Practical examinations will be held at the end of each Semester.
2. 50 marks are allotted for the Practical examination consisting of External and Internal Evaluation.
3. Practical Question Bank is prepared & provided to the students from which practicals will be conducted.

4. Practicals shall be conducted in each Semester as per the Syllabus and Time table.
Resolved to accept the above pattern of examination .
5. Question I – 15 M , Question II – 15 M ,Record – 10 M, Viva – 10 M

Chairman BOS   University Nominee   Members

1.
2.
3.
4.
PRINCIPAL

Government College for Women Begumpet, Hyderabad-500016
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Re-Accredited by NAAC with 'B+' Grade
B.Sc. (Data Science) II Year
Semester-III
Subject: Data Science
Paper–III:Data Engineering with Python

Theory	**4 Hours/Week**	**4 credits**
Practical	**2 Hours/Week**	**1 credit**

<u>**Course Objectives:**</u> The main objective of this course is to teach how to extract raw data, clean the data, perform transformations on data, load data and visualize the data.

<u>Course Outcome</u>**:**
At the end ofthe course the student will be able to:
- Handle different typesof files and work with text data
- Use regular expressionoperations
- Use relational databases via SQL
- Usetabular numeric data
- Use the datastructures:data series and frames
- Use PyPlot for visualization

SYLLABUS

Unit–I
Data Science: Data Analysis Sequence, Data Acquisition Pipeline, Report Structure
Files and Working with Text Data: Types of Files, Creating and Reading Text Data, FileMethods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module,Reading and Writing CSV Files, Python os and os.pathModules. **Workingwith TextData:** JSONandXML in Python

Unit–II
Working with Text Data: Processing HTML Files, Processing Texts in Natural Languages
Regular Expression Operations: Using Special Characters, Regular Expression Methods,Named Groups in Python Regular Expressions, Regular Expression with *glob*

Module

Unit–III
Working with Databases: Setting Up a MySQL Database, Using a MySQL Database:Command Line, Using a MySQL Database, Taming Document Stores: MongoDB
Working with Tabular Numeric Data(Numpy with Python): NumPy Arrays CreationUsing *array()* Function, Array Attributes, NumPy Arrays Creation with Initial PlaceholderContent, Integer Indexing, Array Indexing, Boolean ArrayIndexing, Slicing and Iterating inArrays, Basic Arithmetic Operations on NumPy Arrays, Mathematical Functions in NumPy,Changing the Shape of an Array, Stacking and Splitting of Arrays, Broadcasting in Arrays.

Unit–IV
WorkingwithDataSeriesandFrames:
PandasDataStructures,ReshapingData,HandlingMissing Data, Combining Data, Ordering and Describing Data, Transforming Data, TamingPandasFileI/O
Plotting: Basic Plotting with PyPlot, Getting to Know Other Plot Types, MasteringEmbellishments,PlottingwithPandas

References:
1. DataScienceEssentialsinPython:Collect,Organize,Explore,Predict,Value.DmitryZinoriev, ThePragmaticProgrammers LLC, 2016
2. Introduction to Python Programming**.** Gowrishankar S., Veena A. CRC Press, Taylor &FrancisGroup,2019

SuggestedReading
3. PythonforEverybody:ExploringDataUsing Python3.CharlesRSeverance,2016
4. Python Data Analytics – Data Analysis and Science using Pandas, matplotlib and thePythonProgramming Language. Fabio Nelli, Apress, 2015
5. Website Scraping with Python. Using BeautifulSoup and Scrapy. GáborLászlóHajba,Apress,2018
6. Machine Learning with Python Cookbook:.Practical Solutions from Preprocessing toDeepLearning. Chris Albon, O'Reilly 2018

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B.Sc. (Data Science) II Year
Semester-III
Subject: Data Science
Paper–III:DataEngineering withPython

MODEL PAPER

Time: 2 1/2hrs   **Max Marks: 60**

SECTION-A

I. Answer any 5 questions.   **5X4=20**
  1) Question from Unit-I.
  2) Question from Unit-I.
  3) Question from Unit-II.
  4) Question from Unit-II.
  5) Question from Unit-III.
  6) Question from Unit-III.
  7) Question from Unit-IV
  8) Question from Unit-IV.

SECTION-B

II. Answer all the questions.   **4X10=40**

1. a) Question from Unit-I.
      (OR)
    b) Question from Unit-I.
2. a) Question from Unit-II.
      (OR)
    b) Question from Unit-II.
3. a) Question from Unit-III.
      (OR)
    b) Question from Unit-III.
4. a) Question from Unit-IV.
      (OR)
    b) Question from Unit-IV.

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B.Sc. (Data Science) II Year
Semester-III
Subject: Data Science
Paper :DataEngineeringwithPython(Lab)

Practical	2 Hours/Week	1 credit

Course Objective:
The main objective of this laboratory is to put into practice the ETL (extract, transform, load)pipeline which will extract raw data, clean the data, perform transformations on data, loaddataand visualizethedata.ThisrequiresmentoringbyTCS.

DataEngineeringwithPython(Lab)

Libraries
In this course students are expected to extract, transform and load input data that can be textfiles, CSV files, XML files, JSON, HTML files, SQL databases, NoSQL databases etc.,. Fordoingthis, they should learnthe following Pythonlibraries/modules:
pandas,numpy, BeautifulSoup, pymysql, pymongo, nltk, matplotlib
Datasets
For this laboratory, appropriate publicly available datasets, can be studied and used.Example:
MNIST(http://yann.lecun.com/exdb/mnist/),
UCI Machine Learning
Repository(https://archive.ics.uci.edu/ml/datasets.html),Kaggle(https://www.kaggle.com/datasets)TwitterData
Exercises
1. Write programs to parse text files, CSV, HTML, XML and JSON documents and extractrelevantdata.After retrievingdatacheck anyanomaliesin thedata,missing valuesetc.
2. Writeprogramsforreading andwritingbinaryfiles
3. Write programs for searching, splitting, and replacing strings based on pattern matchingusingregularexpressions
4. Design a relational database for a small application and populate the database. Using SQLdothe CRUD(create, read, update and delete)operations.
5. Create aPython MongoDB client using the Python module pymongo. Using a collectionobject practice functions for inserting, searching, removing, updating, replacing, andaggregatingdocuments, as well as forcreating indexes
6. Write programs to create numpy arrays of different shapes and from different sources,reshape and slice arrays, add array indexes, and apply arithmetic, logic, and aggregationfunctionsto someor all array elements
7. Write programs to use the pandas datastructures: Frames and series as storage containersandforavariety of data-wrangling operations, such as:
   - Single-levelandhierarchicalindexing
   - Handlingmissingdata
   - ArithmeticandBoolean operationsonentirecolumnsandtables

- Database-typeoperations(suchasmerging and aggregation)
- Plottingindividualcolumnsandwholetables
- Readingdatafromfilesandwritingdatato files

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B.SC II (Data Science)Year Examination
Semester – III
Subject: Data Science
Paper- Operating Systems – 1 (SEC-2)
Syllabus

Theory   **2Hours/Week**   **2 credits**

Course Objectives:
A successful student will be able to understand the basic components of a computer operating system, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.

Course Outcome:
- Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.
- They will learn different memory management techniques like paging, segmentation and demand paging etc.

Unit – I
Introduction: Computer-System Architecture, Computing Environments.
Operating-System Structures: Operating-System Services, User Interface for Operating-System, System Calls, Types of System Calls, Operating System Structure.
Process Management: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, Examples–Producer-Consumer Problem.
Process Synchronization: Critical-Section Problem, Peterson's Solution, Synchronization, Semaphores, Monitors.

Unit – II
CPU Scheduling: Concepts, Scheduling Criteria, Scheduling Algorithms.
Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Text   AbrahamSilberschatz,PeterBaerGalvin,GregGagne,OperatingSystemConcepts(9e)

Reference s
NareshChauhan, Principles of Operating Systems
Thomas W. Doeppner, Operating Systems in Depth
Andrew S. Tanenbaum, Modern Operating Systems
William Stallings, Operating Systems – Internals and Design Principles
Dhananjay M. Dhandhere, Operating Systems – A Concept Based Approach

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B.SC II(Data Science)Year Examination
Semester – III
Subject: Data Science
Paper- Operating Systems – 1 (SEC-2)
MODEL PAPER

Time: 1 hr   **Max Marks: 40**

SECTION-A

I Answer Any 4 Questions.   **4X4=16**
   1) Question from Unit-I.
   2) Question from Unit-I.
   3) Question from Unit-I.
   4) Question from Unit-II.
   5) Question from Unit-II.
   6) Question from Unit-II.

SECTION-B

II. Answer All Questions.   **2X12=24**

   7. a) Question from Unit-I.
            (OR)
      b) Question from Unit-I.

   8. a) Question from Unit-II.
            (OR)
      b) Question from Unit-II.

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Re-Accredited by NAAC with 'B+' Grade
B.Sc. (Data Science) II Year
Semester-IV
Subject: Computer Science
Paper–IV:MachineLearning

Theory	**4 Hours/Week**	**4 credits**
Practical	**3 Hours/Week**	**1 credit**

CourseObjectives: The main objective of this course is to teach the principles and foundations of machine learning algorithms.

CourseOutcome:
Atthe end ofthecoursethestudentwillbeable tounderstand
- BasicsofMachine Learningand its limitations
- MachineLearningAlgorithms:supervised,unsupervised,bio-inspired
- ProbabilisticModelingandAssociationRuleMining

SYLLABUS

Unit-I
Introduction: What does it mean to learn, Some canonical Learning Problems, The DecisionTree Model of Learning, Formalizing the Learning Problem, ID3 Algorithm
Limits of Learning: Data Generating Distributions, Inductive Bias, Not Everything islearnable, Underfitting and Overfitting, Separation of training and test Data, Models,parameters and Hyperparameters, Real World Applications of Machine Learning
Geometry and Nearest Neighbors: From Data to Feature Vectors, k-Nearest Neighbors,DecisionBoundaries,k-means Clustering,High Dimensions

Unit-II
The Perceptron: Bio-inspired Learning, The Perceptron Algorithm, GeometricInterpretation, Interpreting Perceptron Weights, Perceptron Convergence and LinearSeparability,Improved Generalization,Limitations of the Perceptron
Practical Issues: Importance of Good Features, Irrelevant and Redundant Features, FeaturePruning and Normalization, Combinatorial Feature Explosion, Evaluating ModelPerformance,CrossValidation,HypothesisTestingandStatisticalSignificance,Debuggin gLearningAlgorithms, Bias Variancetradeoff
Linear Models: The Optimization Framework for Linear Models,Convex Surrogate LossFunctions, Weight Regularization, Optimization and Gradient Descent,Support VectorMachines

Unit-III
Probabilistic Modeling: Classification by Density Estimation, Statistical Estimation,NaïveBayesModels, Prediction

Neural Networks: Bio-inspired Multi-Layer Networks, The Back-propagation Algorithm,Initialization and Convergence of Neural Networks, Beyondtwo layers,Breadth vs Depth,BasisFunctions

UnitIV
Unsupervised Learning: Clustering Introduction, Similarity and Distance Measures,AgglomerativeAlgorithms,DivisiveClustering,MinmumSpanningTree
AssociationRules: Introduction,large Itemsets,AprioriAlgorithm

References:
1. A Course in Machine Learning (CIML). Hal Daume III, 2017 (freely available online)http://ciml.info/
2. DataMining:IntroductoryandAdvancedTopics.MargaretHDunham,PearsonEducation,2003

SuggestedReading:

3. Hands on Machine Learning with SciKit-Learn, Keras and Tensor Flow. AurélienGéron.O'Reily,2019
4. MachineLearningwithPythonCookbook. ChrisAlbo,O'Reily,2018
5. IntroductiontoMachine LearningwithPython:Aguide.AndreasCMiller, SarahGuido.O'Reily,2017

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B.Sc. (Data Science) II Year
Semester-IV
Subject: Data Science
Paper–IV:MachineLearning

MODEL PAPER

Time: 2 1/2hrs   **Max Marks: 60**

SECTION-A

I. Answer any 5 questions.   **5X4=20**
   1) Question from Unit-I.
   2) Question from Unit-I.
   3) Question from Unit-II.
   4) Question from Unit-II.
   5) Question from Unit-III.
   6) Question from Unit-III.
   7) Question from Unit-IV
   8) Question from Unit-IV.

SECTION-B

II. Answer all the questions.   **4X10=40**

1. a) Question from Unit-I.
      (OR)
   b) Question from Unit-I.
2. a) Question from Unit-II.
      (OR)
   b) Question from Unit-II.
3. a) Question from Unit-III.
      (OR)
   b) Question from Unit-III.
4. a) Question from Unit-IV.
      (OR)
   b) Question from Unit-IV.

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B.Sc. (Data Science) II Year
Semester-IV
Subject: Data Science
Paper:MachineLearning(Lab)

Practical   **2 Hours/Week**   **1 credit**

CourseObjective:

The main objective of this laboratory is to put into practice the various machine learningalgorithmsfordata analysis using Python and Weka.

MachineLearning(Lab)

MLToolkits

Studentsareexpectedtolearn

1. Scikit-learn(https://scikit-learn.org/) an open source machine learning Python library thatsupports supervised and unsupervised learning. It also provides various tools for modelfitting,datapreprocessing, modelselection andevaluation, andmany otherutilities.
2. Weka(http://www.cs.waikato.ac.nz/ml/weka/)isanotherwidely usedMLtoolkit.

Datasets

1. The sklearn.datasets package embeds small toy datasets. It includes utilities to loadthese datasets. It also includes methods to load and fetch popular reference datasetsand features some artificial data generators. Students are expected to study and makeuseof thesedatasets
2. Weka alsohasprovides variousdatasets.

References:

1. scikit-learnuserguide.https://scikit-learn.org/stable//_downloads/scikit-learn-docs.pdf
2. Ian Witten,Eibe Frank, andMark Hall,Chris Pal. DATA MINING: Practical MachineLearningToolsandTechniques,4thEdition.MorganKaufmann.

Exercises

8. Write a Python program using Scikit-learn to split the iris dataset into 70% train data and30% test data. Out of total 150 records, the training set will contain 120 records and thetestset contains 30 of thoserecords. Print both datasets
9. Write Python program to use sklearn'sDecisionTreeClassifier to build a decision tree forthe sklearn's datasets. Implement functions to find the importance of a split (entropy,informationgain, gini measure)
10. Write a Python program to implement your own version of the K-means algorithm. Thenapplyit to different datasets andevaluatetheperformance.
11. Design a perceptron classifier to classify handwritten numerical digits (0-9). Implementusingscikit or Weka.
12. Write a Python program to classify text as spam or not spam using the Naïve BayesClassifier
13. Use WEKA and experiment with the following classifiers: Association Rule Mining(Apriori),Agglomerativeand Divisive Clustering

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B.Sc II (Data Science)Year Examination
Semester – III
Subject: Data Science
Paper- Operating Systems – 2 (SEC-4)
Syllabus

Theory   **2 Hours/Week**   **2 credits**

Course Objectives:
- Students will learn how Operating System is Important for Computer System.
- To make aware of different types of Operating System and their services
- To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- To know virtual memory concepts.
- To learn secondary memory management.

Course Outcome:
- Understands the different services provided by Operating System at different level.
- They learn real life applications of Operating System in every field.

Unit – I
Main Memory: Introduction, Swapping, Contiguous Memory Allocation, Segmentation, Paging.
Virtual Memory: Introduction, Demand Paging, Page Replacement, Allocation of Frames, Thrashing.
Mass-Storage Structure: Overview, Disk Scheduling, RAID Structure.
File Systems: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, Protection

.
Unit – II
File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. Recovery, Network File System.
Protection and Security: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Access Control, Revocation of Access Rights, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications.

Text   AbrahamSilberschatz,PeterBaerGalvin,GregGagne,OperatingSystemConcepts(9e)

Reference s
NareshChauhan, Principles of Operating Systems
Thomas W. Doeppner, Operating Systems in Depth
Andrew S. Tanenbaum, Modern Operating Systems
William Stallings, Operating Systems – Internals and Design Principles
Dhananjay M. Dhandhere, Operating Systems – A Concept Based Approach

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B.Sc II(Data Science) Year Examination
Semester – III
Subject: Data Science
Paper- Operating Systems – 2 (SEC-4)
MODEL PAPER

Time: 1 hr   **Max Marks: 40**

SECTION-A

I Answer Any 4 Questions.   **4X4=16**
    1) Question from Unit-I.
    2) Question from Unit-I.
    3) Question from Unit-I.
    4) Question from Unit-II.
    5) Question from Unit-II.
    6) Question from Unit-II.

SECTION-B

II. Answer All Questions.   **2X12=24**

    7. a) Question from Unit-I.
          (OR)
      b) Question from Unit-I.

    8. a) Question from Unit-II.
          (OR)
      b) Question from Unit-II.

GOVERNMENT DEGREE COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD – 16
(An Autonomous college of Osmania University)
Department of Computers

Panel of Examiners for B.Sc. (Data Science) II Year

S. No	Name & Details	Teaching Experience	Phone Number
1.	B.SarithaM.Sc, IPGDC(w),Nampally, Hyd.	16Yrs	9985408390
2.	Smt.B.Ramani M.C.A, Andhra Mahila Sabha Arts and Science College , OU road ,HYD.	15 Yrs	9441214888
3.	Ch.N Saranya M.Sc(cs),(PhD),(PGDDS) Assistant Professor Email-id:nagasaranya@gmail.com	12Yrs	9849555856