

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
(AUTONOMOUS)**

**B. Tech - CSE (Artificial Intelligence & Machine Learning)  
(Effective for the batches admitted from 2021-22)**

**Semester II (First year)**

Sl.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	TOTAL
				L	T	P				
1	BS	20ABS9911	Probability and Statistics	3	0	0	3	30	70	100
2	BS	20ABS9921	Numerical Methods	3	0	0	3	30	70	100
3	ES	20AES3303	Basics of Python Programming	3	0	0	3	30	70	100
4	ES	20AES3305	Data Structures	3	0	0	3	30	70	100
5	ES	20AES3307	Web Design	1	0	4	3	30	70	100
6	ES Lab	20AES3304	Basics Of Python Programming Lab	0	0	3	1.5	30	70	100
7	BS Lab	20ABS9918	Computational Lab	0	0	3	1.5	30	70	100
8	ES Lab	20AES3306	Data Structures Lab	0	0	3	1.5	30	70	100
9	MC	20AMC9903	Environmental Studies	2	0	0	0	30	0	30
			<b>Total credits</b>				<b>19.5</b>	<b>270</b>	<b>560</b>	<b>830</b>

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI  
(AUTONOMOUS)**

**Year: I**

**Semester: II**

**Branch of Study: AI & ML**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>20ABS9911</b>	<b>Probability and Statistics</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Outcomes:**

- CO1:** Interpret the characteristics through correlation and regression tools.
- CO2:** Make use of the concepts of probability and their applications.
- CO3:** Apply discrete and continuous probability distributions.
- CO4:** Infer the components of a classical hypothesis test for large sample
- CO5:** Inspect the components of a classical hypothesis test for small samples.

**Unit-1:**

**10 Hrs**

**Descriptive statistics and methods for data science**

Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines

**UNIT-2:**

**8 hrs**

**Probability**

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

**UNIT-3:**

**8 hrs**

**Probability distributions**

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties.

**Unit-4:**

**8 hrs**

**Estimation and Testing of hypothesis, large sample tests**

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

**Unit-5:**

**8 hrs**

**Small sample tests**

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test),  $\chi^2$  - test for goodness of fit.

**Textbooks:**

1. Miller and Friends, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

**Reference Books:**

1. S.Chand, Probability and Statistics, Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N.Prasad
2. S. Ross, a First Course in Probability, Pearson Education India, 2002.
3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

**Online Learning Resources:**

[www.nptel.ac.in](http://www.nptel.ac.in)

**Mapping of course outcomes with program outcomes**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>PSO 1</b>	<b>PSO 2</b>
<b>CO1</b>	<b>3</b>													
<b>CO2</b>		<b>2</b>												
<b>CO3</b>		<b>2</b>												
<b>CO4</b>			<b>3</b>											
<b>CO5</b>			<b>3</b>											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)**

**Year: I**

**Semester: II**

**Branch of Study: AI & ML**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9921	Numerical Methods	3	0	0	3

**Course Outcomes:**

- CO1:** Analyze the concepts of Errors, Relative and Percentage Errors
- CO2:** Analyze the concepts of Algebraic & Transcendental Equations to solve different Engineering problems
- CO3:** Analyze Interpolation using the concepts of the Numerical Methods
- CO4:** Apply the concepts of Integration in Numerical Methods
- CO5:** Apply the concepts of O.D.E on Numerical Methods

**Unit - I**

**Errors in Numerical computations:** Errors and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

**UNIT – II**

**Solution of Algebraic and Transcendental Equations:** The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout’s triangularisation method, Gauss - Seidal iteration method.

**UNIT – III**

**Interpolation:** Newton’s forward and backward interpolation formulae – Lagrange’s formulae. Gauss forward and backward formula, Stirling’s formula, Bessel’s formula.

**UNIT – IV**

**Curve fitting:** Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton’s interpolation formula. Numerical Integration: Trapezoidal rule – Simpson’s 1/3 Rule – Simpson’s 3/8 Rule.

**UNIT –V**

**Numerical solution of Ordinary Differential equations:** Solution by Taylor’s series-Picard’s Method of successive Approximations-Euler’s Method- Runge - Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

**TEXT BOOKS:**

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

**REFERENCES:**

1. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, McGraw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High**

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)**

Year: I	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3303	Basics of Python Programming	3	0	0	3

**Course Objectives:**

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

**Course Outcomes (CO):**

- CO1:** Understanding the syntax and semantics of Python programming.  
**CO2:** Apply modularity to programs.  
**CO3:** Select appropriate data structure of Python for solving a problem.  
**CO4:** Implement Mutable and Immutable data types  
**CO5:** Interpret the concepts of object oriented programming as used in Python

**Unit-1:**

**Introduction:** What is a program, Running python, Arithmetic operators, Value and Types.

Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

**Functions:**Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flowof Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

**Unit-2:**

**Case study:** The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

**Conditionals and Recursion:** floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, InfiniteRecursion, Keyboard input.

**Fruitful Functions:** Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types.

**Unit-3:**

**Iteration:** Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.**Strings:**

A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

**Case Study:** Reading word lists, Search, Looping with indices.

**Lists:** List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Mapfilter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

**Unit-4:**

**Dictionaries:** A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries,Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

**Tuples:** Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples,Lists and tuples, Dictionaries and tuples, Sequences of sequences.

**Files:** Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

**Classes and Objects:** Programmer-defined types, Attributes, Instances as Return values, Objects are mutable,Copying.

**Unit-5:**

**Classes and Functions:** Time, Pure functions, Modifiers, Prototyping versus Planning

**Classes and Methods:** Object oriented features, Printing objects, Theinit method, The \_\_str method,Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

**Inheritance:** Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Removeshuffleand sort, Inheritance, Class diagrams, Data encapsulation.

**The Goodies:** Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args.

**Text books:**

1. Allen B. Downey, -Think Python, 2nd edition, SPD/O'Reilly, 2016.

**Reference Books:**

1. Martin C.Brown, -The Complete Reference: Python, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, -Fundamentals of Python, CENGAGE, 2015.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	<b>3</b>		<b>2</b>		<b>2</b>									
<b>CO2</b>	<b>2</b>			<b>2</b>									<b>2</b>	<b>1</b>
<b>CO3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>									<b>2</b>	<b>1</b>
<b>CO4</b>	<b>2</b>		<b>3</b>		<b>2</b>								<b>2</b>	<b>1</b>
<b>CO5</b>	<b>2</b>	<b>2</b>	<b>3</b>		<b>3</b>				<b>2</b>				<b>2</b>	<b>1</b>

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI(AUTONOMOUS)**

**Year: I**

**Semester: II**

**Branch of Study: AI & ML**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>20AES3305</b>	<b>Data Structures</b>	3	0	0	3

**Course Objectives:**

1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithm analysis
3. To introduce different data structures for solving the problems
4. To demonstrate modeling of the given problem as a graph
5. To elucidate the existing hashing techniques

**Course Outcomes (CO):**

**CO1:** Analyze and evaluate the efficiency of an algorithm

**CO2:** Implement linear data structures

**CO3:** implement non -linear data structures

**CO4:** Solve the problem of efficiently using graphs and Hashing techniques

**CO5:** Implement advanced sorting and organizing the file

**Unit-1:**

**Introduction**

Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

**Unit-2:**

**Stack, Queue and Linked lists**

Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

**Unit-3:**

**Trees**

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: B- Trees, B + Trees.

**Unit-4 :**

**Graphs and Hashing**

The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure

Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

**Unit-5:**

**Files and Advanced sorting**

File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization.

**Advanced sorting: Sorting** on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

**Text Books:**

1. Ellis Horowitz and SartajSahni, –Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, GalgotiaBook Source, Pvt. Ltd.,2004.
2. Alan L. Tharp, -File Organization and Processing, Wiley and Sons,1988.

**Reference Books:**

1. D. Samanta, -Classic Data Structures, 2<sup>nd</sup> Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, –Advanced Data Structures, Cambridge University Press, 2016
3. Richard F.Gilberg, BehrouzA.Forouzan, -Data Structures A Pseudo code Approach with C, Second Edition, Cengage Learning 2005.

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3										2	2	
CO2	3	2	2		2							1	2	1
CO3	3	2	2		2							1	2	1
CO4	3	2	2	2								1	2	2
CO5	3	2	2	2	2							1	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)



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(AUTONOMOUS)

Year: I	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES3307	Web Design	1	0	4	3

**Course Outcomes:**

- CO1:** Add elements to web pages, including colors, text, images, and more
- CO2:** Add advanced features to your website including special effects
- CO3:** Apply the CSS Knowledge to add colors and text formatting
- CO4:** Apply advanced CSS style presentation and techniques
- CO5:** Develop HTML and CSS Programs.

**Unit -1:**

**Where Do I Start**-What Does a Web Designer Do, What Languages Do I Need to Learn, What Do I Need to Buy, How the Web Works-The Internet Versus the Web, Serving Up Your Information, A Word About Browsers, Web Page Addresses (URLs), The Anatomy of a Web Page, Some Big Concepts You Need to Know-A Dizzying Multitude of Devices, Sticking with the Standards, Progressive Enhancement, Responsive Web Design, One Web for All (Accessibility), The Need for Speed (Site Performance)

**HTML Markup for Structure:** Creating a Simple Page-A Web Page, Launch a Text Editor, Step 1: Start with Content, Step 2: Give the Document Structure, Step 3: Identify Text Elements, Step 4: Add an Image, Step 5: Change the Look with a Style Sheet, When Good Pages Go Bad, Validating Your Documents. Marking Up Text-Paragraphs, Headings, Lists, More Content Elements, Organizing Page Content, The Inline Element Roundup, Generic Elements (div and span), Some Special Characters

**Unit -2:**

**HTML Markup for Structure:** Adding Links-The href Attribute, Linking to Pages on the Web, Linking Within Your Own Site, Targeting a New Browser Window, Mail Links, Telephone Links. Adding Images-First, a Word on Image Formats, The img Element, A Window in a Window. Table Markup-How Tables Are Used, Minimal Table Structure, Spanning Cells, Table Accessibility, Wrapping Up Tables

**HTML Markup for Structure:** Forms-How Forms Work, The form Element, Variables and Content, The Great Form Control Roundup, Form Accessibility Features, Form Layout and Design. What's Up, HTML5-A Funny Thing Happened on the Way to XHTML 2, In the Markup Department, Meet the APIs, Video and Audio, Canvas

**Unit-3:**

**CSS for Presentation:** Cascading Style Sheets Orientation-The Benefits of CSS, How Style Sheets Work, The Big Concepts, Moving Forward with CSS. Formatting Text-The Font Properties, Changing Text Color, A Few More Selector Types, Text Line Adjustments, Underlines and Other "Decorations", Changing Capitalization, Spaced Out, Text Shadow, Changing List Bullets and Numbers. Colors and Backgrounds-Specifying Color Values, Foreground Color, Background Color, Playing with Opacity, Introducing...Pseudo-class Selectors, Pseudo-element Selectors, Attribute Selectors, Background Images, The Shorthand background Property, Like a Rainbow (Gradients), External Style Sheets. Thinking Inside the Box-The Element Box, Specifying Box Dimensions, Padding, Borders, Margins, Assigning Display Roles, Adding Drop Shadows to Boxes

**Unit-4:**

**CSS for Presentation:** Floating and Positioning- Normal Flow, Floating, Positioning Basics, Relative Positioning, Absolute, Positioning, Fixed Positioning. Page Layout with CSS- Page Layout Strategies, page Layout Techniques, Multicolumn Layouts Using Floats, Positioned Layout, Top-to-Bottom Column Backgrounds. Transitions, Transforms, and Animation- Ease-y Does It (CSS Transitions), CSS Transforms, Keyframe Animation. **CSS Techniques-** A Clean Slate (CSS Reset), Image Replacement Techniques, CSS Sprites, Styling Forms, Styling Tables, Basic Responsive Web Design, Wrapping Up Style Sheets.

**Unit-5:**

1. Design a page having suitable background colour and text colour with title -My First Web Page using all the attributes of the Font tag.
2. Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag.
3. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style.

4. Create a page to show different character formatting (B, I, U, SUB, SUP) tags.
  - i. viz :  $\log_{10} 10^m = p \log_{10} m$
5. Write HTML code to create a Web Page that contains an Image at its centre.
6. Create a web page with an appropriate image towards the left hand side of the page, when user clicks on the image another web page should open.
7. Create web Pages using Anchor tag with its attributes for external links.
8. Create a web page for internal links; when the user clicks on different links on the web page it should go to the appropriate locations/sections in the same page.
9. Write a HTML code to create a web page with pink colour background and display moving message in red colour.
10. Create a web page, showing an ordered list of all second semester courses (Subjects).
11. Create a web page, showing an unordered list of names of all the Diploma Programmes (Branches) in your institution.
12. Create a HTML document containing a nested list showing a content page of any book.
13. Create the following table in HTML

Student	Maths	Physics	Chemistry	Computer
I-R2C1	I-R1C1	I-R4C1	I-C2	
	II-C1		II-C1	II-R1C5
III-R2C2			III-C1	
			IV-C1	

14. Create a web page which divides the page in two equal frames and place the audio and video clips in frame-1 and frame-2 respectively.

<b>i. FRAME-1</b>	<b>ii. FRAME-2</b>
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15. Create a web page which should generate following output:

<b>i. FRAME-1</b>	<b>ii. FRAME-2</b>
	<b>iii. FRAME-3</b>

16. Create a table to show your class time table.
17. Use tables to provide layout to your HTML page describing your college infrastructure.
18. Use <span> and <div> tags to provide a layout to the above page instead of a table layout.
19. Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
20. Embed Audio and Video into your HTML web page.
21. Create a webpage with HTML describing your department use paragraph and list tags.
22. Apply various colors to suitably distinguish key words , also apply font styling like italics, underline and two other fonts to words you find appropriate , also use header tags.
23. Create links on the words e.g. –Wi-Fi and –LAN| to link them to Wikipedia pages.
24. Insert an image and create a link such that clicking on image takes user to other page.
25. Change the background color of the page; At the bottom create a link to take user to the top of the page.
26. Develop static pages (using only HTML) of an online book store, the pages should resemble: www.amazon.com, the website should consist the following pages, home page, registration and user login, user profile page, books catalog, shopping cart, payment by credit card, order confirmation.
27. Create a web page using Embedded CSS and multimedia
28. Write an HTML page that contains a selection box with a list of 5 countries, when the user selects a country, its capital should be printed next to the list; Add CSS to customize the properties of the font of the capital (color, bold and font size).
29. Wap in html to design a Bio-Data.
30. Wap in html to create a webpage with four frames (Picture, table, list, and hyperlink).
31. Wap in html to show all character elements in html.
32. Wap in html to create a webpage to show the block level elements and text level elements.
33. Wap in html to create a webpage to show various confectionary items using ordered list and unordered list.
34. Wap in html to create a webpage to show different hobbies.
35. Wap in html to show India map.
36. Wap in html to create a web page using style sheet.
37. Wap in html to create a web page to show registration
38. Wap in html to show books in inventory in different tables by using rowspan and colspan.
39. Create a Web Page in HTML to show Admission form in OITM
40. A Web Page in HTML to show your resume using Appropriate Formatting Elements.
41. A Web Page in HTML to show all the Text, Color, Background and Font Elements
42. Write a Program to Create a Nested List.

**Textbooks:**

1. Jennifer Niederst Robbins, -Learning Web Design , OREILLY 4th Edition

**References:**

1. Uttam K Roy, –Web Technologies!, Oxford University Press, 1st Edition, 2010.
2. HTML and CSS: Design and Build Websites 1st Edition by Jon Duckett (Author) india price
3. Steven Holzner, –The Complete Reference PHP!, Tata McGraw-Hill, 1st Edition, 2007.
4. HTML & CSS: The Complete Reference, Fifth Edition (Complete Reference Series)
5. Deitel and Deitel and Nieto, –Internet and World Wide Web - How to Program!, Prentice Hall, 5 th Edition, 2011.

**Online Learning Resources:**

1. <http://www.scoopworld.in>
2. <http://www.sxecw.edu.in>
3. <http://www.technofest2u.blogspot.com>
4. <http://www.ptutorial.com/php-example/php-upload-image>
5. <http://www.ptutorial.com/php-example/php-change-case>

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2						1				2	2
CO2	3		2						1				2	2
CO3	3		2						1				2	2
CO4	3		2						1				2	2
CO5	3		3						1				2	2

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**Branch of Study: AI & ML**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>20AES3304</b>	<b>Basics Of Python Programming Lab</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To understand the fundamentals of Python programming concepts and its applications.
- To understand the object-oriented concepts using Python in problem solving.

**Course Outcomes (CO):**

**CO1:** Write, Test and Debug Python Programs

**CO2:** Implement Conditionals and Loops for Python Programs

**CO3:** Use functions and represent Compound data using Lists, Tuples and Dictionaries

**CO4:** Read and write data from & to files in Python and develop Application using Python

**CO5:** Implement the problem in terms of real world object using OOPs concepts

**List of Experiments:**

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a Scientific Calculator
2. Write a function that draws a grid like the following:

```
+ - - - - + - - - - +  
|         |         |  
|         |         |  
|         |         |  
|         |         |  
+ - - - - + - - - - +  
|         |         |  
|         |         |  
|         |         |  
|         |         |  
+ - - - - + - - - - +
```

3. Write a function that draws a Pyramid with # symbols

```
#  
  
# # #  
  
# # # # #  
  
# # # # # # #
```

Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of your choice
5. Write a program that draws Archimedean Spiral
6. The letters of the alphabet can be constructed from a moderate number of basic elements, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.
7. The time module provides a function, also named time that returns the current Greenwich Mean Time in "the epoch", which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January 1970.

```
>>> import time  
>>>time.time()  
1437746094.5735958
```

Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.

8. Given  $n+r+1 \leq 2r$ .  $n$  is the input and  $r$  is to be determined. Write a program which computes minimum value of  $r$  that satisfies the above.
9. Write a program that evaluates Ackermann function
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of  $1/\pi$  :  
Write a function called `estimate_pi` that uses this formula to compute and return an estimate of  $\pi$ .

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

- It should use a while loop to compute terms of the summation until the last term is smaller than  $1e-15$  (which is Python notation for  $10^{-15}$ ). You can check the result by comparing it to `math.pi`.
11. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.
  12. Given a text of characters, Write a program which counts number of vowels, consonants and special characters.
  13. Given a word which is a string of characters. Given an integer say 'n', Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.
  14. Given rows of text, write it in the form of columns.
  15. Given a page of text. Count the number of occurrences of each letter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same
  16. Write program which performs the following operations on list's. Don't use built-in functions
    - a) Updating elements of a list
    - b) Concatenation of list's
    - c) Check for member in the list
    - d) Insert into the list
    - e) Sum the elements of the list
    - f) Push and pop element of list
    - g) Sorting of list
    - h) Finding biggest and smallest elements in the list
    - i) Finding common elements in the list
  17. Write a program to count the number of vowels in a word.
  18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
  19. Go to Project Gutenberg (<http://gutenberg.org>) and download your favorite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.
  20. Go to Project Gutenberg (<http://gutenberg.org>) and download your favorite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.
  21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
  22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
  23. Write a program illustrating the object oriented features supported by Python.
  24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.
  25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format ( $0 \leq YYYY \leq 9999$ ,  $1 \leq MM \leq 12$ ,  $1 \leq DD \leq 31$ ) following the leap year rules.
  26. Design a Python Script to determine the time difference between two given times in HH:MM:SS format. ( $0 \leq HH \leq 23$ ,  $0 \leq MM \leq 59$ ,  $0 \leq SS \leq 59$ )

### Reference Books:

1. Allen B. Downey , “ Think Python: How to Think Like a Computer Scientist”, Second Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Shroff “Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.
3. David M.Baezly “Python Essential Reference”. Addison-Wesley Professional; Fourth edition, 2009. 4
4. David M. Baezly “Python Cookbook” O'Reilly Media; Third edition (June 1, 2013)

### Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	2								1	1
CO2	2	1	3		2								1	2
CO3	2	1	3		2								2	2
CO4	2	1	3		2								2	2
CO5	3	2	2		2				2			3	2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**  
**(AUTONOMOUS)**

**Year: II**

**Semester: I**

**Branch of Study: AI & ML**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>20ABS9918</b>	<b>Computational Lab</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**COURSE OUTCOMES:**

**CO1:** To understand solving problems in linear algebra using MS-Excel's Tools.

**CO2:** To analyse Central Tendency, Dispersion, Correlation and Regression analysis as basics of Statistics using Ms-Excel's Tools.

**CO3:** To understand properties of probability distributions and to perform using Ms- Excel's Tools.

**CO4:** Solving problems in Definite integrals numerically using Trapezoidal and Simpson's methods in Ms-Excel's Tools.

**CO5:** To analyse Statistics to solve large samples and Small samples problems using Statistical Tools practising in Ms-Excel's Tools.

**CONCEPTS TO BE COVERED**

1. Algebraic operations on matrices, transpose of a matrix.
2. Finding determinant, inverse of a matrix.
3. Solving system of equations and consistency – Non Homogeneous equations
4. Rank of a matrix - Row reduced Echelon form.
5. Practice theory behind the descriptive statistics like measures of central tendency with examples.
6. Solving Measures of dispersion concepts with examples.
7. Practicing concept of Correlation with some examples.
8. Solving Regression analysis with some examples.
9. Solving Skewness concept with examples.
10. 10. Practising the Concept of Kurtosis with examples.
11. Solving the Numerical Integration by Trapezoidal rule and Simpson's 1/3 rule .
12. Fitting a Straight line and power curve using Ms-Excel Tools.
13. Using functions in MS-Excel to calculate the probabilities for Binomial distribution.
14. 14. Using functions in MS-Excel to calculate the probabilities for Poisson distribution.
15. Using functions in MS-Excel to calculate the probabilities for Normal distribution.
16. Using functions in MS-Excel to calculate the probabilities for Geometric distribution.
17. Using functions in MS-Excel to calculate the probabilities for Uniform distribution.
18. 18. Testing Single mean in large samples and difference between two means large samples using Z –test.
19. Testing Single proportion in large samples and difference between two proportions in large samples using Z –test.
20. Testing Single mean in small samples using t- test.
21. Testing Student's t-Test for difference of means.
22. Testing Paired - Sample 't' test in small samples using t- test.
23. 23. Testing difference between two means in small samples using t- test.
24. Solving problems on Chi- square test for testing goodness of fit.

**References**

1. Higher Engineering in Mathematics, Dr. B.S. Grewal of Khanna Publishers, 42<sup>nd</sup> Edition .
2. Miller and Friends, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
4. S.Chand ,Probability and Statistics, Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N.Prasad

**Year: I**

**Semester: II**

**Branch of Study: AI & ML**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>20AES3306</b>	<b>Data Structures Lab</b>	0	0	3	1.5

**Course Outcomes:**

- CO1:** Select the data structure appropriate for solving the problem
- CO2:** Implement searching and sorting algorithms
- CO3:** Derive new data types
- CO4:** Illustrate the working of linear and non linear data structure
- CO5:** Organize the data using Files structure

**Laboratory Experiments**

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using ‘Ladies first’ principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table data type and support different operations on it.

**Textbooks:**

1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures in C”, 2<sup>nd</sup> Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, “File Organization and Processing”, Wiley and Sons, 1988.

**Reference Books:**

1. D. Samanta, “Classic Data Structures”, 2<sup>nd</sup> Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Richard F.Gilberg, Behrouz A.Forouzan, “Data Structures A Pseudo code Approach with C”, Second Edition, Cengage Learning 2005.

**Online Learning Resources:**

<https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F>

**Mapping of course outcomes with program outcomes**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	2		2								2	2	
<b>CO2</b>	3	2	2	2	2							1	2	2
<b>CO3</b>	3	2	2	2								1	2	1
<b>CO4</b>	3	2	2	2	2							1	2	
<b>CO5</b>	3	2	2	2								1	2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**  
(AUTONOMOUS)

Year: I	Semester: II	Branch of Study: AI & ML			
COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AMC9903	Environmental Studies	2	0	0	0

**Course Outcomes:**

- CO1:** To recognize and to understand the importance and scope of Environmental Studies.
- CO2:** To understand the importance of protecting natural resources, ecosystem for future generation by communication each other in the society create the awareness
- CO3:** Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
- CO4:** By studying Environmental Science, students are exposed to the environment the enables one to find out solution of various environmental problems, encountered on and often.
- CO5:** At the end of the course, it is expected that student will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. These will enable every human being to live in a more sustainable manner.

**UNIT -1:**

**Multidisciplinary Nature of Environmental Studies:** Introduction – Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.

**Natural Resources:** Renewable and non-renewable energy resources – Natural resources and associated problems.

**Forest resources:** Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.

**Water resources:** Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.

**Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

**Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.

**Energy resources:** Renewable and non-renewable energy resources

**UNIT-2:**

**Ecosystems:** Concept of an ecosystem. – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

**Biodiversity And Its Conservation :** Introduction- Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

**UNIT-3:**

**Environmental Pollution:** Definition, Causes, effects and its control measures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

**Solid Waste Management:** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

**UNIT-4:**

**Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Public awareness.

**UNIT-5:**

**Human Population and the Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS



- Women and Child Welfare - Role of information Technology in Environment and human health - Case studies.

**Text Books:**

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

**Reference Books:**

1. Environmental studies by R. Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P. Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

**Online Learning Resources:**

[www.nptel.ac.in](http://www.nptel.ac.in)

**Mapping of course outcomes with program outcomes**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1			1	3							
CO2	3	1	1			1	3							
CO3	3	1	1			1	3							
CO4	3	1	1			1	3	2						
CO5	3	1	1			1	3	2				1		

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

