Scheme & Syllabus of
Bachelor of Science in Artificial Intelligence and Machine Learning
B.Sc. (AI & ML)

Batch 2020 onwards

By

Board of Study Computer Applications

Department of Academics
I.K.GujralPunjab Technical University

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Bachelor of Science in Artificial Intelligence and Machine Learning B.Sc.(AI & ML):

It is an Under Graduate (UG) Programme of 3 years duration (6 semesters)

Eligibility: All those candidates who have passed 10+2 in Non-Medical from recognized Board / University / Council with atleast 50% marks (45% marks in case of candidate belonging to Reserved Category) in aggregate.

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

First Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1901	Core Theory	Mathematics	3	1	0	40	60	100	4
UGCA1902	Core Theory	Fundamentals of Computer and IT	3	1	0	40	60	100	4
UGCA1914	Core Theory	Programming in Python	3	1	0	40	60	100	4
UGCA1958	Core Practical/Laboratory	Workshop on Multimedia Tools	0	0	4	60	40	100	2
UGCA1917	Core Practical/Laboratory	Programming in Python Laboratory	0	0	4	60	40	100	2
UGCA1906	Core Practical/Laboratory	Fundamentals of Computer and IT Laboratory	0	0	4	60	40	100	2
BTHU103/18	Ability Enhancement Compulsory Course (AECC)-I	English	1	0	0	40	60	100	1
BTHU104/18	Ability Enhancement Compulsory Course (AECC)	English Practical/Laboratory	0	0	2	30	20	50	1
HVPE101-18	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction and Traffic Rules	3	0	0	40	60	100	3
HVPE102-18	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction and Traffic Rules (Lab/ Seminar)*	0	0	1	25	0	25	1
BMPD102-18		Mentoring and Professional Development *#	0	0	1	25	0	25	1
	TOTAL		**13**	**03**	**16**	**460**	**440**	**900**	**25**

* The Human Values, De-addiction and Traffic Rules (Lab/ Seminar) and Mentoring and Professional Development course will have internal evaluation only.

See guidelines at the last page of this file

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Second Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1907	Core Theory	Fundamentals of Statistics	3	1	0	40	60	100	4
UGCA1923	Core Theory	Operating Systems	3	1	0	40	60	100	4
UGCA1915	Core Theory	Data Structures	3	1	0	40	60	100	4
UGCA1918	Core Practical/Laboratory	Data Structures Laboratory	0	0	4	60	40	100	2
UGCA1926	Core Practical/Laboratory	Operating Systems Laboratory	0	0	4	60	40	100	2
UGCA1911	Core Practical/Laboratory	Fundamentals of Statistics Laboratory	0	0	4	60	40	100	2
EVS102-18	Ability Enhancement Compulsory Course (AECC) -III	Environmental Science	2	0	0	40	60	100	2
BMPD202-18		Mentoring and Professional Development	0	0	1	25	--	25	1
	TOTAL		**11**	**3**	**13**	**365**	**360**	**725**	**21**

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1901
Course Name: Mathematics

Program: B.Sc. (AI & ML)	**L:** 3 **T:** 1 **P:** 0
Branch: Computer Applications	**Credits:** 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status: core/elective:** Core

Prerequisite: Student must have the knowledge of Basic Mathematics.
Co requisite: NA.
Additional material required in ESE: -NA-
Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Represent data using various mathematical notions.
CO2	Explain different terms used in basic mathematics.
CO3	Describe various operations and formulas used to solve mathematical problems.

Detailed contents	Contact hours
Unit-I Set Introduction, Objectives, Representation of Sets (Roster Method, Set Builder Method), Types of Sets (Null Set, Singleton Set, Finite Set, Infinite Set, Equal Set, Equivalent Set, Disjoint Set, Subset, Proper Subset, Power Set, Universal Set) and Operation with Sets (Union of Set, Intersection of Set, Difference of Set, Symmetric Difference of Set) Universal Sets, Complement of a Set.	12 hours
Unit-II Logic Statement, Connectives, Basic Logic Operations (Conjunction, Disjunction, Negation) Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.	10 hours
Unit -III Matrices Introduction, Types of Matrix (Row Matrix, Column Matrix, Rectangular Matrix, Square Matrix, Diagonal Matrix, Scalar Matrix, Unit Matrix, Null Matrix, Comparable Matrix, Equal Matrix), Scalar Multiplication, Negative of Matrix, Addition of Matrix, Difference of two	12 hours

Matrix, Multiplication of Matrices, Transpose of a Matrix.	
Unit-IV Progressions Introduction, Arithmetic Progression, Sum of Finite number of quantities in A.P, Arithmetic Means, Geometric Progression, Geometric Mean.	10 hours

Text Books:

1. Discrete Mathematics and Its Applications by Kenneth H. Rosen, McGraw Hill, 6th Edition.
2. College Mathematics, Schaum's Series, TMH.

Reference Books:

1. Elementary Mathematics, Dr. RD Sharma
2. Comprehensive Mathematics, Parmanand Gupta
3. Elements of Mathematics, ML Bhargava

E Books/ Online learning material

1. www.see.leeds.ac.uk/geo-maths/basic_maths.pdf
2. www.britannica.com/science/matrix-mathematics
3. www.pdfdrive.com/schaums-outline-of-discrete-mathematics-third-edition-schaums-e6841453.html

----

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1902

Course Name: Fundamentals of Computer and IT

Program: B.Sc. (AI & ML)	**L**: 3 **T**: 1 **P**: 0
Branch: Computer Applications	**Credits:** 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Understanding the concept of input and output devices of Computers
CO2	Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.
CO3	Understand an operating system and its working, and solve common problems related to operating systems
CO4	Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.
CO5	Study to use the Internet safely, legally, and responsibly

Detailed Contents	Contact hours
Unit-I **Human Computer Interface** Concepts of Hardware and Software; Data and Information. **Functional Units of Computer System:** CPU, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors. **Devices:** Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter. **Memory:** Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.	12

Data Representation: Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT.	
Unit-II **Concept of Computing, Types of Languages:** Machine, assembly and High level Language; Operating system as user interface, utility programs. **Word processing:** Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors.	10
Unit-III **Spreadsheet:** Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs. **Presentation Graphics Software:** Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.	10
Unit-IV **The Impact of Computing and Internet on Society** Introduction to Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT), Unified Payment Interface (UPI), Immediate Payment System (IMPS), Digital Signature and Certification Authority. Concept of Mobile Computing, Cloud Computing, Big Data and Internet of Things (IoT)	12

Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2. Fundamentals of Computers, P. K.Sinha& P. Sinha, 2007, BPB Publishers.
3. IT Tools, R.K. Jain, Khanna Publishing House

4. "Introduction to Information Technology", Satish Jain, AmbrishRai&Shashi Singh, Paperback Edition, BPB Publications, 2014.

Reference Books:

1. "Introduction to Computers", Peter Norton
2. Computers Today, D. H. Sanders, McGraw Hill.
3. "Computers", Larry long & Nancy long, Twelfth edition, Prentice Hall.
4. Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen F Monk, Thomson Learning.
5. Computer Fundamentals, A. Goel, 2010, Pearson Education

E Books/ Online learning material

1. www.sakshat.ac.in
2. https://swayam.gov.in/course/4067-computer-fundamentals

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1914

Course Name: Programming in Python

Program: B.Sc. (AI & ML)	**L**:3 **T**:1 **P**:0
Branch: Computer Applications	**Credits**: 4
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: 40%
Internal max. marks: 40	**Duration of end semester exam (ESE):**3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE:-NA-

Course Outcomes: Students will be able to:

CO#	Course Outcomes
CO1	Familiar with Python environment, data types, operators used in Python.
CO2	Compare and contrast Python with other programming languages.
CO3	Learn the use of control structures and numerous native data types with their methods.
CO4	Design user defined functions, modules, and packages and exception handling methods.
CO5	Create and handle files in Python and learn Object Oriented Programming Concepts.

Detailed Contents	Contact hours
Unit-I **Introduction to Python Programming Language:** Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages. **Python Data Types & Input/Output:** Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command.	12

Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators.	
Unit-II **Control Structures:** Decision making statements, Python loops, Python control statements. **Python Native Data Types:** Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).	10
Unit-III **Python Functions:** Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. **Python Modules:** Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.	12
Unit-IV **Exception Handling:** Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. **File Management in Python:** Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python. **Classes and Objects:** The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.	10

Text Books:

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.
2. Core Python Programming, R. NageswaraRao, 2nd Edition, Dreamtech.

Reference Books:

1. Python, The complete Reference, Martin C. Brown, McGraw Hill Education.
2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

Course Code: UGCA1958
Course Name: Workshop on Multimedia Tools

Program: B.Sc. (AI & ML)	**L**:0 **T**:0 **P**:4
Branch: Computer Applications	**Credits:** 2
Semester: 1st	**Contact hours:** 2 hours per week
Internal max. marks: 60	**Theory/Practical:** Practical
External max. marks:40	**Duration of end semester exam (ESE):** 3hrs
Total marks:100	**Elective status:** Core

Prerequisite: Basic understanding of computer system and images.
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes: After completing this course, students will be able to:

CO#	Course outcomes
CO1	Define terms related to multimedia technologies.
CO2	Implement basic image editing.

Detailed contents	Contact hours
Unit-I Introduction: Objectives – History of Multimedia – Its market – Content copyright – Resources for multimedia developers – Types of produces – Evaluation – Hardware Architecture – OS and Software – Multimedia Architecture – Software library – Drivers.	4
Unit-II Downloading and installing free open source multimedia tool like GIMP, understanding its workspace (toolbox, menus, panels). **Paint Tools**: Common Features, Dynamics, Brush Tools (Pencil, Paintbrush, Airbrush), Bucket Fill, Blend, Pencil, Paintbrush, Eraser, Airbrush, Ink, Clone, Heal, Perspective Clone, Blur/Sharpen, Smudge, Dodge/Burn, applying fills and outlines – creating default fills and outlines – gradient fill – types – custom fill – copy – clone – mesh – gradient mesh	8
Unit-III **Transform Tools**: Common Features, Align, Move, Crop, Rotate, Scale, Shear, Perspective, Flip, The Cage Tool.	5

Color Tools: Overview, Color Balance, Hue-Saturation, Colorize, Brightness-Contrast, Threshold, Levels, Curves, Posterize, Desaturate.	
Unit-IV **Animation**: Text Animation methods, building an animated GIF, Animating a still image, Morphing, re-synthesizer tool. Designing for a webpage: Web Design tools, Variable and fixed sized designs, Optimizing images for web.	5

* Students can choose multimedia tool of their choice. Recommended tool is GIMP.

Text Book:

1. A book of GIMP: A guide to nearly everything, Olivier Lecarme, KarineDelvare Published by no starch press, California.
2. Multimedia Technology and Applications – David Hillman-Galgotia Publications pvt. Ltd, 1998.

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1917
Course Name: Programming in Python Laboratory

Program: B.Sc. (AI & ML)	**L**: 0 **T**: 0 **P**:4
Branch: Computer Applications	**Credits**: 2
Semester: 1st	**Contacthours**: 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems**: 90%
Internal max. marks: 60	**Duration of end semester exam (ESE)**: 3hrs
External max. marks:40	**Elective Status :** Core
Total marks: 100	

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: - Maintain practical note book as per the instructions given by the instructor.

Course Outcomes: Students will be able to :

CO#	Course outcomes
CO1	Solve simple to advanced problems using Python language.
CO2	Develop logic of various programming problems using numerous data types and control structures of Python.
CO3	Implement different data structures.
CO4	Implement modules and functions.
CO5	Design and implement the concept of object oriented programming structures.
CO6	Implement file handling.

List of assignments:

1.	Compute sum, subtraction, multiplication, division and exponent of given variables input by the user.
2.	Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and parallelogram.
3.	Compute volume of following 3D shapes: cube, cylinder, cone and sphere.
4.	Compute and print roots of quadratic equation $ax^2+bx+c=0$, where the values of a, b, and c are input by the user.
5.	Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,….
6.	Write a program to determine whether a triangle is isosceles or not?
7.	Print multiplication table of a number input by the user.
8.	Compute sum of natural numbers from one to n number.
9.	Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13…..n
10.	Compute factorial of a given number.
11.	Count occurrence of a digit 5 in a given integer number input by the user.

12.	Print Geometric and Harmonic means of a series input by the user.

13.	Evaluate the following expressions:
	   a. $x-x^2/2!+x^3/3!-x^4/4!+\ldots x^n/n!$
	   b. $x-x^3/3!+x^5/5!-x^7/7!+\ldots x^n/n!$

14.	Print all possible combinations of 4, 5, and 6.
15.	Determine prime numbers within a specific range.
16.	Count number of persons of age above 60 and below 90.
17.	Compute transpose of a matrix.
18.	Perform following operations on two matrices. 1) Addition 2) Subtraction 3) Multiplication
19.	Count occurrence of vowels.
20.	Count total number of vowels in a word.
21.	Determine whether a string is palindrome or not.
22.	Perform following operations on a list of numbers: 1) Insert an element 2) delete an element 3) sort the list 4) delete entire list
23.	Display word after Sorting in alphabetical order.
24.	Perform sequential search on a list of given numbers.
25.	Perform sequential search on ordered list of given numbers.
26.	Maintain practical note book as per their serial numbers in library using Python dictionary.
27.	Perform following operations on dictionary 1) Insert 2) delete 3) change
28.	Check whether a number is in a given range using functions.
29.	Write a Python function that accepts a string and calculates number of upper case letters and lower case letters available in that string.
30.	To find the Max of three numbers using functions.
31.	Multiply all the numbers in a list using functions.
32.	Solve the Fibonacci sequence using recursion.
33.	Get the factorial of a non-negative integer using recursion.
34.	Write a program to create a module of factorial in Python.
35.	Design a Python class named *Rectangle,* constructed by a length & width, also design a method which will compute the area of a rectangle.
36.	Design a Python class named *Circle* constructed by a radius and two methods which will compute the area and the perimeter of a circle.
37.	Design a Python class to reverse a string 'word by word'.
38.	Write a Python program to read an entire *text file*.
39.	Design a Python program to read first n lines of a *text file*.
40.	Construct a Python program to write and append text to a file and display the text.

Text Books:

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.
2. Core Python Programming, R. NageswaraRao, 2ndEdiiton, Dreamtech.

Reference Books:

1. Python, The complete Reference, Martin C. Brown, McGraw Hill Education.
2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

Course Code: UGCA1906
Course Name:Fundamentals of Computer and ITLaboratory

Program: B.Sc. (AI & ML)	**L**: 0 **T**: 0 **P**: 4	
Branch: Computer Applications	**Credits**: 2	
Semester: 1st	**Contact hours:**4 hours per week	
Internal max. marks: 60	**Theory/Practical:** Practical	
External max. marks: 40	**Duration of end semester exam (ESE):** 3hrs	
Total marks: 100	**Elective status:** Core	

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Familiarizing with Open Office (Word processing, Spreadsheets and Presentation).
CO2	To acquire knowledge on editor, spread sheet and presentation software.
CO3	The students will be able to perform documentation and accounting operations.
CO4	Students can learn how to perform presentation skills.

Instructions:

Word Orientation:
The instructor needs to give an overview of word processor.
Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

1.	Using word to create Resume Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.
2.	Creating an Assignment Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3.	Creating a Newsletter Features to be covered :- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs
4.	Creating a Feedback form Features to be covered :- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Excel Orientation:

The instructor needs to tell the importance of Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files,

1.	Creating a Scheduler
	Features to be covered :- Gridlines, Format Cells, Summation, auto fill, Formatting Text
2.	Calculations
	Features to be covered :- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
3.	Performance Analysis
	Features to be covered :- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting
4.	Game (like Cricket, badminton) Score Card
	Features to be covered :- Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

Presentation Orientation:

1.	Students will be working on basic power point utilities and tools which help them create basic power point presentation.
	Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows
2.	This session helps students in making their presentations interactive.
	Topics covered includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts
3.	Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation.
	Topics covered includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides. Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing
4.	Power point test would be conducted. Students will be given model power point presentation which needs to be replicated

Internet and its Applications:

The instructor needs to tell the how to configure Web Browser and to use search engines by defining search criteria using Search Engines

1.	To learn to setup an e-mail account and send and receive e-mails
2.	To learn to subscribe/post on a blog and to use torrents for accelerated downloads
3.	Hands on experience in online banking and Making an online payment for any domestic bill

Reference Books:

1. IT Tools, R.K. Jain, Khanna Publishing House
2. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
3. Introduction to information technology, Turban, Rainer and Potter, John Wiley and Sons
4. Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen F Monk, Thomson Learning

----

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: BTHU103/18

Course Name:English (Ability Enhancement Compulsory Course (AECC)-I))

Program: B.Sc. (AI & ML)	**L**: 1**T**: 0**P**: 0
Branch: Computer Applications	**Credits:**1
Semester: 1st	**Contact hours:** 11 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	The objective of this course is to introduce students to the theory, fundamentals and tools of communication.
CO2	To help the students become the independent users of English language
CO3	To develop in them vital communication skills which are integral to their personal, social and professional interactions.
CO4	The syllabus shall address the issues relating to the Language of communication.
CO5	Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc.

The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

Detailed Contents:
Unit1- 1 (Introduction)
- Theory of Communication
- Types and modes of Communication

Unit- 2 (Language of Communication)
- Verbal and Non-verbal
- (Spoken and Written)
- Personal, Social and Business
- Barriers and Strategies
- Intra-personal, Inter-personal and Group communication

Unit-3 (Reading and Understanding)

- Close Reading
- Comprehension
- Summary Paraphrasing
- Analysis and Interpretation
- Translation(from Hindi/Punjabi to English and vice-versa)
  OR
  Precis writing /Paraphrasing (for International Students)
- Literary/Knowledge Texts

Unit-4 (Writing Skills)

- Documenting
- Report Writing
- Making notes
- Letter writing

Recommended Readings:

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English*, Pearson, 2008.
3. *Language, Literature and Creativity*, Orient Blackswan, 2013.
4. *Language through Literature* (forthcoming) ed. Dr. Gauri Mishra, DrRanjanaKaul, DrBratiBiswas
5. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
6. *Study Writing*. Liz Hamp-Lyons and Ben Heasly.Cambridge University Press. 2006.

Course Code: BTHU104/18

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)
Course Name: English Practical/Laboratory (Ability Enhancement Compulsory Course (AECC))

Program: B.Sc. (AI & ML)	**L**: 0 **T**: 0 **P**: 2
Branch: Computer Applications	**Credits**: 1
Semester: 1st	**Contact hours:** 2 hours per week
Internal max. marks: 30	**Theory/Practical:** Practical
External max. marks: 20	**Duration of end semester exam (ESE):** 3hrs
Total marks: 50	**Elective status:** Core

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	The objective of this course is to introduce students to the theory, fundamentals and tools of communication.
CO2	To help the students become the independent users of English language.
CO3	To develop in them vital communication skills which are integral to personal, social and professional interactions.
CO4	The syllabus shall address the issues relating to the Language of communication.
CO5	Students will become proficient in professional communication such as interviews, group discussions and business office environments, important reading skills as well as writing skills such as report writing, note taking etc.

The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

Interactive practice sessions in Language Lab on Oral Communication

- Listening Comprehension
- Self Introduction, Group Discussion and Role Play
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations
- Monologue
- Effective Communication/ Mis- Communication

- Public Speaking

Recommended Readings:

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English*, Pearson, 2008.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. *Communication Skills*. Sanjay Kumar and PushpLata.Oxford University Press. 2011.
5.*Exercises in Spoken English*. Parts.I-III. CIEFL, Hyderabad. Oxford University Press

----

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: HVPE101-18

Course Name: Human Values, De-addiction and Traffic Rules

Program: B.Sc. (AI & ML)	**L**: 3 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 3
Semester: 1st	**Contact hours:**33 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Ability Enhancement

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
CO2	To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
CO3	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Note: This course is intended to provide a much needed orientational input in Value Education to the young enquiring minds.

Detailed Contents	Contact hours
Unit-I **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** 1. Understanding the need, basic guidelines, content and process for Value Education 2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facilities- the basic	8

requirements for fulfillment of aspirations of every human being with their correct priority 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels	
Unit-II **Understanding Harmony in the Human Being - Harmony in Myself!** 1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' *2.* Understanding the needs of Self ('I') and 'Body' - *Sukh*and *Suvidha* 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 4. Understanding the characteristics and activities of 'I' and harmony in 'I' 5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail 6. Programs to ensure *Sanyam* and *Swasthya* - Practice Exercises and Case Studies will be taken up in Practice Sessions.	8
Unit-III **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** 1. Understanding harmony in the Family- the basic unit of human interaction *2.* Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship 3. Understanding the meaning of *Vishwas*; Difference between intention and competence 4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship *5.* Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva*as comprehensive Human Goals 6. Visualizing a universal harmonious order in society- Undivided	8

Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family! - Practice Exercises and Case Studies will be taken up in Practice Sessions.	
Unit-IV **Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** 1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature 3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space 4. Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.	4
Unit-V **Implications of the above Holistic Understanding of Harmony on Professional Ethics** 1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 4. Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) Ability to identify and develop appropriate technologies and management patterns for above production systems. 5. Case studies of typical holistic technologies, management models and production systems 6. Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations.	5

Text Book

1. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*.

Reference Books

1. Ivan Illich, 1974, *Energy & Equity,*The Trinity Press, Worcester, and Harper Collins, USA.
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
3. A Nagraj, 1998, *JeevanVidyaekParichay,*Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How *the Other Half Dies,* Penguin Press. Reprinted 1986, 1991.
5. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Common wealth Publishers.
6. A.N. Tripathy, 2003, *Human Values,*New Age International Publishers.
7. SubhasPalekar, 2000, *How to practice Natural Farming,* Pracheen (Vaidik) KrishiTantraShodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome's report*, Universe Books.
9. E G Seebauer& Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers,* Oxford University Press
10. M Govindrajran, S Natrajan& V.S. Senthil Kumar, *Engineering Ethics (including Human Values)*, Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, *Foundations of Ethics and Management,* Excel Books.
12. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, *http://uhv.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: HVPE102-18
Course Name:Human Values, De-addiction and Traffic Rules (Lab/ Seminar)

Program: B.Sc. (AI & ML)	**L**: 0 **T**: 0 **P**: 1
Branch: Computer Applications	**Credits:** 1
Semester: 1st	**Contact hours:** 1 hour per week
Internal max. marks: 25	**Theory/Practical:** Practical
External max. marks: 0	**Duration of end semester exam (ESE):** 3hrs
Total marks: 25	**Elective status:**Ability Enhancement

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

One each seminar will be organized on Drug De-addiction and Traffic Rules. Eminent scholar and experts of the subject will be called for the Seminar at least once during the semester. It will be binding for all the students to attend the seminar.

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1907
Course Name: Fundamentals of Statistics

Program:B.Sc. (AI & ML)	L: 3 T: 1 P: 0
Branch: Computer Applications	**Credits:** 4
Semester: 2nd	**Contact hours:** 44 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: Students must have the basic knowledge of mathematic terms.
Co requisite:NA
Additional material required in ESE: Minimum twoexercises of each concept will be recorded in the file and the file will be submitted in End Semester Examinations.
Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Understand the science of studying & analyzing numbers.
CO2	Identify and use various visualization tools for representing data.
CO3	Describe various statistical formulas.
CO4	Compute various statistical measures.

Detailed Contents	Contact hours
Unit I Statistics and Probability: Introduction to Statistics – Origin of Statistics, Features of Statistics, Scope of Statistics, Functions of Statics, Uses and importance of Statistics, Limitation of Statistics, Distrust of Statistics Collection of Data: Introduction to Collection of Data, Primary and Secondary Data, Methods of Collecting Primary Data, Methods of Secondary Data, Statistical Errors, Rounding off Data (Approximation).	8 hours
Unit II Classification of Data Frequency Distribution: Introduction Classification of Data, Objectives of Classification, Methods of Classification, Ways to Classify Numerical Data or Raw Data. Tabular, Diagrammatic and Graphic Presentation of Data: Introduction to Tabular Presentation of Data, Objectives of	12 hours

Tabulation, Components of a Statistical Table, General Rules for the Construction of a Table, Types of Tables, Introduction to Diagrammatic Presentation of Data, Advantage and Disadvantage of Diagrammatic Presentation, Types of Diagrams, Introduction to Graphic Presentation of Data, Advantage and Disadvantage of Graphic Presentation, Types of Graphs.	
Unit III Measures of Central tendency: Introduction to Central Tendency, Purpose and Functions of Average, Characteristics of a Good Average, Types of Averages, Meaning of Arithmetic Mean, Calculation of Arithmetic Mean, Merit and Demerits of Arithmetic Mean, Meaning of Median, Calculation of Median, Merit and Demerits of Median, Meaning of Mode, Calculation of Mode, Merit and Demerits of Mode, Harmonic Mean- Properties- Merit and Demerits.	12 hours
Unit IV Measures of Dispersion: Meaning of Dispersion, Objectives of Dispersion, Properties of a good Measure of Dispersion, Methods of Measuring Dispersion, Range Introduction, Calculation of Range , Merit and Demerits of Range, Mean Deviation, Calculation of Mean Deviation , Merit and Demerits of Mean Deviation, Standard Deviation Meaning, Calculation of Standard Deviation , Merit and Demerits of Standard Deviation, Coefficient of Variation, Calculation of Coefficient Variance, Merit and Demerits of Coefficient of Variation.	12 hours

Text Books:
1. Statistics and Data Analysis, A.Abebe, J. Daniels, J.W.Mckean, December 2000.
2. Statistics, Tmt. S. EzhilarasiThiru, 2005, Government of Tamilnadu.
3. Introduction to Statistics, David M. Lane.
4. Weiss, N.A., Introductory Statistics. Addison Wesley, 1999.
5. Clarke, G.M. & Cooke, D., A Basic course in Statistics. Arnold, 1998.

Reference Books:

1. Banfield J.(1999), Rweb: Web-based Statistical Analysis, Journal of Statistical Software.

2. Bhattacharya,G.K. and Johnson, R.A.(19977), Statistical Concepts and Methods, New York, John Wiley & Sons.

E-Books/ Online learning material

1. http://onlinestatbook.com/Online_Statistics_Education.pdf
2. https://textbookcorp.tn.gov.in/Books/12/Std12-Stat-EM.pdf
3. https://3lihandam69.files.wordpress.com/2015/10/introductorystatistics.pdf

----

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1923
Course Name: Operating Systems

Program: B.Sc. (AI & ML)	**L**: 3 **T**: 1 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: Basic understanding of computer system.
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes: After completing this course, students will be able to:

CO#	Course outcomes
CO1	Discuss the evaluation of operating systems.
CO2	Explain different resource managements performed by operating system.
CO3	Describe the architecture in terms of functions performed by different types of operating systems.
CO4	Analyze the performance of different algorithms used in design of operating system components.

Detailed contents	Contact hours
Unit-I **Fundamentals of Operating system**: Introduction to Operating system, Functions of an operating system. Operating system as a resource manager. Structure of operating system (Role of kernel and Shell). Views of operating system. Evolution and types of operating systems. **Process & Thread Management**: Program vs. Process; PCB, State transitiondiagram, Scheduling Queues, Types of schedulers, Concept of Thread, Benefits, Types of threads, synchronization issues. **CPU Scheduling**: Need of CPU scheduling, CPU I/O Burst Cycle, Pre-emptivevs. Non-pre-emptive scheduling, Different scheduling criteria's, scheduling algorithms (FCSC, SJF, Round-Robin, Multilevel Queue).	12
Unit-II **Memory Management**: Introduction, address binding, relocation, loading,	11

linking, memory sharing and protection; Paging and segmentation; Virtual memory: basic concepts of demand paging, page replacement algorithms.	
Unit-III **I/O Device Management**: I/O devices and controllers, device drivers; disk storage. **File Management**: Basic concepts, file operations, access methods, directory structures and management, remote file systems; file protection.	10
Unit-IV **Advanced Operating systems:** Introduction to Distributed Operating system, Characteristics, architecture, Issues, Communication & Synchronization; Introduction Multiprocessor Operating system, Architecture, Structure, Synchronization & Scheduling; Introduction to Real-Time Operating System, Characteristics, Structure& Scheduling.	11

Text Books:

1. Operating System Principles by Abraham Silberschatz and Peter Baer Galvin, Seventh Edition, Published by Wiley-India.
2. Principals of Operating System by NareshChauhan, Published by OXFORD University Press, India.

Reference Books:

1. Operating Systems by SibsankarHaldar and Alex A. Aravind, Published by Pearson Education.
2. Operating system by Stalling, W., Sixth Edition, Published by Prentice Hall (India)

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1915

Course Name: Data Structures

Program: B.Sc. (AI & ML)	**L**:3 **T**:1 **P**:0
Branch: Computer Applications	**Credits**:4
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems: --**
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks:60	**Elective status:** Core
Total marks:100	

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes: Students will be able to

CO#	Course outcomes
CO1	Apply appropriate constructs of Programming language, coding standards for application development
CO2	Use appropriate data structures for problem solving and programming
CO3	Use algorithmic foundations for solving problems and programming
CO4	Apply appropriate searching and/or sorting techniques for application development.
CO5	Develop programming logic and skills.

Detailed Contents	Contact hours
Unit-I **Introduction to Data Structures:** Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion. **Arrays, Pointers and Strings:** Introduction to Arrays, Definition, One Dimensional Array and Multi-Dimensional Arrays, Pointer, Pointer to Structure, various Programs for Array and Pointer. Strings. Introduction to Strings, Definition, Library Functions of Strings.	10
Unit-II **Stacks and Queue**	8

Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.	
Unit-III **Linked Lists and Trees** Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List. **Trees** Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.	14
Unit-IV **Graphs, Searching, Sorting and Hashing** **Graphs:** Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms. **Searching and Sorting:** Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort. **Hashing:** Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing	12

Text Books

1. BrijeshBakariya. Data Structures and Algorithms Implementation through C, BPB Publications.
2. Kruse R.L. Data Structures and Program Design in C; PHI
3. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", AddisonWesley

Reference books
1. Horowitz &Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.
2. YashwantKanetkar, Understanding Pointers in C, BPB Publications.
3. Horowitz, S. Sahni, and S. Rajasekaran, Computer Algorithms, Galgotia Pub. Pvt. Ltd., 1998.

Course Code: UGCA1918
Course Name: Data Structures Laboratory

Program: B.Sc. (AI & ML)	**L**:0 **T**:0 **P**:4
Branch: Computer Applications	**Credits**:2
Semester:2nd	**Contact hours:**4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems: --**
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks:40	**Elective status:** Core
Total marks: 100	

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: - NA-

Course Outcomes: Student will be able to

CO#	Course outcomes
CO1	Applyappropriate constructs of Programming language, coding standards for application development
CO2	Develop programming skills for solving problems.
CO3	Apply appropriate searching and/or sorting techniques for application development.

Instructions: Programs may be developed in C/C++/Python/Javalanguage.
List of assignments:

1	Program for using Dynamic Functions (malloc(), calloc(), realloc() and free()) functions.
2	Program to insert, delete and traverse an element from an array
3	Program to merge one dimensional arrays
4	Program for addition and subtraction of two matrices.
5	Program for implementing multiplication of two matrices
6	Implement linear search using one and two dimensional array.
7	Program for implementing selection sort.
8	Program for implementing insertion sort.
9	Program for implementing quick sort.
10	Program for implementing merge sort.
11	Program to calculate length of the string using user defined function.
12	Program to concatenate and compare two strings using user defined function.
13	Program for using the concept of pointer to string.
14	Program to reverse a sentence by recursion.
15	Program to delete all repeated words in string.

16	Program to find the number of vowels, consonants, digits and white space in a string.
17	Program to find the length of the longest repeating sequence in a string.
18	Program to find highest and lowest frequency character in a string.
19	Program for implementing Stack using array.
20	Program for implementing Stack using pointer.
21	Program for implementing multiple stack.
22	Program for converting infix to postfix form.
23	Program for implementing Queue using array.
24	Program for dynamic implementation of queue.
25	Program for implementing circular queue.
26	Program for implementing dequeue.
27	Program for implementing priority queue.
28	Program for implementing Singly Linked list.
29	Program for implementing Doubly Linked list.
30	Program for implementing Binary Search Tree.
31	Program for Breadth First Search (BFS) for graph traversal.
32	Program for Depth First Search (DFS) for graph traversal.

Reference Books:

1. BrijeshBakariya. Data Structures and Algorithms Implementation through C, BPB Publications.
2. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", AddisonWesley
3. Horowitz &Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1926

Course Name: Operating Systems Laboratory

Program: B.Sc. (AI & ML)	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 2nd	**Contact hours**: 4 hours per week
Internal max. marks: 60	**Theory/Practical:** Practical
External max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes: After going through the practical, student will be able to:

CO#	Course outcomes
CO1	Install & configure different operating systems.
CO2	Write programs/ scripts for different scheduling algorithms.

Instructions:

1	Installation of windows OS.
2	Installation of Linux OS.
3	Dual boot installation of Operating systems.
4	Implementation of FCFS Scheduling algorithm
5	Implementation of SJF Scheduling algorithm
6	Implementation of Round-Robin Scheduling algorithm
7	Vi Editor & its commands
8	Shell Commands
9	Shell Scripting- Using variables
10	Shell Scripting- Input & Output
11	Shell Scripting- Data types
12	Shell Scripting- Use of arithmetic operators
13	Shell Scripting- if control statement programs
14	Shell Scripting- while control statement
15	Shell Scripting- for control statement

- Instructor can select programs of their own for implementing different concepts.

Reference Books:

1. Linux: The complete reference by Richard Petersen, Published by Tata McGraw- Hill Publication.
2. Operating System Principles by Abraham Silberschatz and Peter Baer Galvin, Seventh Edition, Published by Wiley-India.

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: UGCA1911
Course Name: Fundamentals of Statistics Laboratory

Program: B.Sc. (AI & ML)	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 2nd	**Contact hours:**4 hours per week
Internal max. marks: 60	**Theory/Practical:** Practical
External max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: Students must have the knowledge of Spreadsheet.

Co requisite: The students will develop analytical behavior & will have better understanding of analyzing data and testing hypotheses.

Additional material required in ESE: Minimum twoexercises of each concept will be recorded in the file and the file will be submitted in End Semester Examinations.

Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Represent data using various Frequency table and Graphs.
CO2	Apply various operations/ formulas using any software/package to solve statistical problems.

Instructions: Sample exercises are given below and Instructor can increase or decrease the experiments as per the requirement.

1:	Display the Maximum and Minimum market data.
2:	Display year wise strength of the students of a college in Tabular form & Graphical form.
3:	Calculate the average marks of the students of your College.
4:	Print measure of Central Tendency using grouped and ungrouped data.
5:	Construct & print frequency distribution using data with the following Techniques: a) Histogram b) Frequency Polygon c) Frequency Curve c) Ogive curves.
6:	Find out & display the Median and Mode from the following series by using suitable method:
7:	Calculate an appropriate measure of dispersion using grouped and ungrouped data.

Class	156-158	158-160	160-162	162-164	164-166
Frequency	4	8	28	51	89

8:	Make an array and calculate range of the data.
9:	Represent the placement record of the students of your college.
10:	Calculate & display Letter Grade using spreadsheet.
11:	Represent the following data by suitable graphs, determine therefrom the number of children having IQ (i) Below 105 (ii) Above 124.

IQ	75-84	85-94	95-104	105-114	115-124	125-134
No. of Children	8	20	45	54	28	16

Reference Books:

1. Statistics for Economics, TR Jain, VK Ohri.
2. Statistics and Data Analysis, A.Abebe, J. Daniels, J.W.Mckean, December 2000.

E-Books/ Online learning material

1. https://www.meritnation.com/cbse-class-11-commerce/economics/class_13_tr_jain.
2. http://college.cengage.com/mathematics/brase/understandable_statistics/9780618949922_ch03.pdf
3. http://www.rockcreekschools.org/pages/uploaded_files/Excel%201%20Lab%20Exercises.pdf

----

I. K. Gujral Punjab Technical University
Bachelor of Science in Artificial Intelligence & Machine Learning (B.Sc. AI & ML)

Course Code: EVS102-18
Course Name: Environmental Science

Program:B.Sc. (AI & ML)	**L**: 2 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits:** 2
Semester: 2nd	**Contact hours:** 22 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks:60	**Duration of end semester exam (ESE):** 3hrs
Total marks:100	**Elective status:**Ability Enhancement

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Students will enable to understand environmental problems at local and national level through literature and general awareness.
CO2	The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.
CO3	The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems.
CO4	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world

Detailed Contents	Contact hours
Unit-I **Introduction to Environmental Studies** Multidisciplinary nature of Environmental Studies: Scope & Importance Need for Public Awareness.	2
Unit-II **Ecosystems** Concept of an Ecosystem: Structure & functions of an ecosystem (Producers, Consumers & Decomposers) Energy Flow in an ecosystem: Food Chain, Food web and Ecological Pyramids Characteristic features, structure & functions of following Ecosystems:	4

• Forest Ecosystem • Aquatic Ecosystem (Ponds, Lakes, River & Ocean)	
Unit-III **Natural Resources** Renewable & Non-renewable resources Forest Resources: Their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Overexploitation, Deforestation, Timber extraction, Agriculture Pressure), Forest Conservation Act Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values, Overexploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting, Land Resources: Land as a resource; Land degradation, soil erosion and desertification Energy Resources: Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy	4
Unit-IV **Biodiversity & its conservation** Types of Biodiversity: Species, Genetic & Ecosystem India as a mega biodiversity nation, Biodiversity hot spots and biogeographic regions of India Examples of Endangered & Endemic species of India, Red data book	4
Unit-V **Environmental Pollution & Social Issues** Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution Nuclear hazards and accidents & Health risks Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting of Glaciers & Ice caps, Rising sea levels Environmental disasters: Earthquakes, Floods, Cyclones, Landslides	4
Unit-VI	4

Field Work Visit to a National Park, Biosphere Reserve, Wildlife Sanctuary Documentation & preparation of a Biodiversity (flora & fauna) register of campus/river/forest Visit to a local polluted site: Urban/Rural/Industrial/Agricultural Identification & Photography of resident or migratory birds, insects (butterflies) Public hearing on environmental issues in a village	

Text Books:

1. Bharucha, E. Text Book for Environmental Studies. University Grants Commission, New Delhi.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment (R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
10. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
11. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
12. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
13. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
14. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
15. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
16. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
17. Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
18. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
19. Survey of the Environment, The Hindu (M)

20. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
21. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
22. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

----

Guidelines regarding Mentoring and Professional Development

The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Part – A
(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B
(Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B
Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.