# SIES (Nerul) College of Arts, Science and Commerce (Autonomous)

## B.Sc. (COMPUTER SCIENCE)

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | Title of the course | B. Sc (COMPUTER SCIENCE) |
| 2 | Eligibility for admission | HSC or Equivalent with Mathematics and Statistics as one of the subjects or its equivalent. |
| 3 | Minimum percentage | 40% |
| 4 | Semesters | I |
| 5 | Level | UG |
| 6 | Pattern | 04 years & 08 semesters CBGS |
| 7 | To be implemented from | From Academic year 2023-24 in a progressive manner |

# SIES (Nerul) College of Arts, Science and Commerce (Autonomous)
## (Affiliated to University of Mumbai)
### RE-ACCREDITED GRADE "A" BY NAAC (3rd CYCLE)

### BOARD OF STUDIES
### SYLLABUS FOR
### B.SC (COMPUTER SCIENCE)

### (WITH EFFECT FROM THE ACADEMIC YEAR 2023-2024)

## OBJECTIVES OF THE PROGRAMME

1. To develop an understanding and knowledge of the basic theory of Computer Science with good foundation on theory, systems, and applications.
2. To foster necessary skills and analytical abilities for developing computer-based solutions of real-life problems.
3. To provide training in emergent computing technologies which lead to innovative solutions for industry and academia.
4. To develop the necessary study skills and knowledge to pursue further post-graduate study in computer science or other related fields.
5. To develop the professional skillset required for a career in an information technology-oriented business or industry.
6. To enable students to work independently and collaboratively, communicate effectively, and become responsible, competent, confident, insightful, and creative users of computing technology.

## PROGRAMME OUTCOMES:

1. At the end of the program, students will develop technical, computational, and soft skills required for secure and reliable software and communications networks.
2. Students will develop the ability to design, test and implement sustainable computer-based systems to meet industry requirements.
3. Ability to develop an understanding of professional, ethical, legal, security and social issues as well as responsibilities while developing and using computer software.
4. Ability to pursue higher education or become self-employed by applying the knowledge of computer science to solve real world problems.
5. Ability to develop technical projects addressing the needs of diverse domains.

# SIES(Nerul) College of Arts, Science and Commerce (Autonomous)

## Department of Computer Science

## NEP Credit Structure for 2023 - 24

| Semester | Major | Minor | OE (Basket) | VSC, SEC (VSEC) | AEC, VEC, IKS | OJT, FP, CEP, CC, RP | Cum. Cr./ Sem. |
|---|---|---|---|---|---|---|---|
| I | Introduction to Python Programming (04 Credits) | Descriptive Statistics (04 Credits) | Business Economics (04 Credits) | VSC-Computer Organization (02 Credits)) SEC-Basics of Web Programming (02 Credits) | AEC-Effective Communication – I (02 Credits) VEC-Environmental studies (02 Credits) IKS- Indian Astronomy (02 Credits) | __ | 22 |
| Total | 4 | 4 | 4 | 4 | 6 | | 22 |

# SCHEME OF MODULES

| Serial No. | Course Code | Credits | Course Name |
|---|---|---|---|
| **Semester I** | | | |
| **I** | **Major Department Specific Course (DSC)** | | |
| 1 | U23CS1MJ01 | 03 | Introduction to Python Programming |
| 2 | U23CS1MJP01 | 01 | Introduction to Python Programming Practical |
| **II** | **Minor Department Specific Course** | | |
| 1 | U23CS1MI01 | 03 | Descriptive Statistics |
| 2 | U23CS1MIP01 | 01 | Descriptive Statistics Practical |
| **III** | **Open Electives (OE)/ Generic Electives** | | |
| 1 | U23CS1E01 | 04 | Business    Economics |
| **IV** | **VOCATIONAL COURSE (VC) & SKILL ENHANCEMENT COURSE (SEC)** | | |
| 1 | U23CS1VSCP01 | 02 | Basics of Web Programing |
| 2 | U23CS1SEC01 | 01 | Computer Organization |
| 3 | U23CS1SECP01 | 01 | Computer Organization Practical |
| **V** | **ABILITY ENHANCEMENT COURSE(AEC)/VALUE EDUCATION COURSE (VEC) / INDIAN KNOWLEDGE SYSTEM (IKS)** | | |
| 1 | U23CS1AEC01 | 02 | Effective Communication - I |
| 2 | U23CS1VEC01 | 02 | Environmental studies |
| 3 | U23CS1IKS01 | 02 | Indian Astronomy |
| **TOTAL CREDITS** | | **22** | |

## Introduction to Python Programming

**COURSE CODE: U23CS1MJ01**                                        **COURSE CREDIT: 03**

**1 credit - 15 lectures**
**1 lecture is 60 minutes.**
**Course Objectives:**

- To learn how to design and program Python applications and to explore the innards of Python Programming and understand components of Python Program.
- To define the structure and components of a Python program and to learn how to write loops and decision statements in Python.
- To learn about inbuilt input/output operations and compound data types in Python and to learn about functions and strings in Python. And to learn about list, dictionaries, and file handling in Python

**Course Outcomes:**

- Ability to learn how to store, manipulate and access data in Python and write loops and decision statements in Python.
- Ability to learn how to write functions and pass arguments in Python
- Ability to write OOP based programs using python

| Unit | Syllabus | No. of Lectures |
|------|----------|-----------------|
| 1 | **Introduction:** The Python Programming Language, History, features, Installing Python, Running Python program, Debugging: Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses, <br> **Variables and Expressions:** Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations. <br> **Conditional Statements:** if, if-else, nested if –else <br> **Looping:** for, while, and nested loops <br> **Control statements:** Terminating loops, skipping specific conditions | 15 |
| 2 | **Functions:** Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions? Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types <br> **Strings:** A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations. | 15 |
| 3 | **Lists**: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods <br> **Tuples and Dictionaries**: Tuples, accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods <br> **List Comprehensions & OOPS in Python:** Anonymous Functions, List Comprehensions, Introduction to Object Oriented Programming – Defining Class in Python, Creating Object in Python, Directory Methods in Python, Methods (String, Tuples, Lists, Dictionaries). | 15 |

**References:**

1. Introduction to Computing and Problem-Solving Using Python by E Balagurusamy, Mc Graw Hill. 2017
2. Programming and Problem solving with Python by Ashok Namdev Kamthane and Amit Ashok Kamthane, Mc Graw Hill. 2020
3. Python Programming by Kiran Gurbani and Ashwin Mehta, Himalaya Publications. 2018

# Introduction to Python Programming Practical

**COURSE CODE: U23CS1MJP01**                    **COURSE CREDIT: 01**

**1 credit - 2 lectures**

**1 lecture is 60 minutes.**

| Sr. No | List of Practical |
|---|---|
| 1 | Write the program for the following:<br>a. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.<br>b. Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user. |
| 2 | Write the program for the following:<br>a. Write a program to perform arithmetic operations.<br>b. Write a program that swaps the user defined values. |
| 3 | Write the program for the following:<br>a. Write a program to generate the Fibonacci series.<br>b. Write a function that reverses the user defined value. |
| 4 | Write the program for the following:<br>a. Write a recursive function to print the factorial for a given number.<br>b. Write a function to check the input value is Armstrong and also write the function for Palindrome. |
| 5 | Write the program for the following:<br>a. Write a function that takes a character (i.e., a string of length 1) and returns True if it is a vowel, False otherwise.<br>b. Define a function that computes the length of a given list or string.<br>c. Define a procedure histogram () that takes a list of integers and prints a histogram to the screen. For example, histogram ([4, 9, 7]) should print the following:<br>****<br>*********<br>******* |
| 6 | Write the program for the following:<br> a. A pangram is a sentence that contains all the letters of the English alphabet at least once, for example: The quick brown fox jumps over the lazy dog. Your task here is to write a function to check a sentence to see if it is a pangram or not.<br>b. Take a list, say for example this one: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] and write a program that prints out all the elements of the list that are less than 5. |
| 7 | Write the program for the following:<br> a. Write a program that takes two lists and returns True if they have at least one common member.<br>b. Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.<br>c. Write a Python program to clone or copy a list |
| 8 | Write the program for the following:<br> a. Write a Python script to sort (ascending and descending) a dictionary by value.<br>b. Write a Python script to concatenate the following dictionaries to create a new one. Sample Dictionary: |

| | |
|---|---|
| | dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60} Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}<br>c. Write a Python program to sum all the items in a dictionary. |
| 9 | Write the program for the following:<br> a. Design a class that stores the information of student and display the same.<br> b. Implement the concept of inheritance using python. |
| 10 | Write the program for the following:<br>a. Create a class called Numbers, which has a single class attribute called MULTIPLIER, and a constructor which takes the parameters x and y (these should all be numbers).<br>i. Write a method called add which returns the sum of the attributes x and y.<br>ii. Write a class method called multiply, which takes a single number parameter and returns the product of a and MULTIPLIER.<br>iii. Write a static method called subtract, which takes two number parameters, b and c, and returns b - c.<br>iv. Write a method called value which returns a tuple containing the values of x and y. Make this method into a property, and write a setter and a deleter for manipulating the values of x and y. |

**COURSE CODE : U23CS1MI01**                                                                          **COURSE CREDIT: 03**

**1 credit - 15 lectures**
**1 lecture is 60 minutes.**
**Course Objectives:**

- To develop the learner's ability to deal with different types of data and to enable the use of different measures of central tendency and dispersion wherever relevant.
- To make learner aware about the techniques to check the Skewness and Kurtosis of data.
- To make learner enable to find the correlation between different variables and further apply the regression analysis to find the exact relation between them and develop ability to analyze statistical data through R software.

**Course Outcomes:**

- Ability to organize, manage and present data.
- Ability to analyse Statistical data using measures of central tendency and dispersion.
- Study the relationship between variables using techniques of correlation and regression.

| Unit | Syllabus | No. of Lectures |
|------|----------|-----------------|
| 1 | **Data Types and Data Presentation**: Data types: Attribute, Variable, Discrete and Continuous variable, Univariate and Bivariate distribution. Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio. <br> **Data presentation**: Frequency distribution, Histogram, Ogive curves. <br> **Introduction to R**: Data input, Arithmetic Operators, Vector Operations, Matrix Operations, Data Frames, Built-in Functions. Frequency Distribution, Grouped Frequency Distribution, Diagrams and Graphs, Summary statistics for raw data and grouped frequency distribution. <br> Measures of Central tendency: Concept of average/central tendency, characteristics of good measure of central tendency. Arithmetic Mean (A.M.), Median, Mode - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits, and demerits. <br> **Combined arithmetic:** mean. Partition Values: Quartiles, Deciles and Percentiles - examples for ungrouped and grouped data | 15 |
| 2 | **Measures dispersion**: Concept of dispersion, Absolute and Relative measure of dispersion, characteristics of good measure of dispersion. Range, Semi-interquartile range, Quartile deviation, Standard deviation - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined standard deviation, Variance. Coefficient of range, Coefficient of quartile deviation and Coefficient of variation (C.V.) <br> **Moments**: Concept of Moments, Raw moments, Central moments, Relation between raw and central moments. <br> **Measures of Skewness and Kurtosis**: Concept of Skewness and Kurtosis, measures based on moments, quartiles. | 15 |
| 3 | **Correlation**: Concept of correlation, Types and interpretation, Measure of Correlation: Scatter diagram and interpretation; Karl Pearson's coefficient of correlation (r): Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, properties; Spearman's rank correlation coefficient: Definition, examples of with and without repetition. Concept of Multiple correlation. <br> **Regression**: Concept of dependent (response) and independent (predictor) variables, concept of regression, Types and prediction, difference between correlation and regression, Relation between correlation and regression. Linear Regression - Definition, examples using least square method and regression coefficient, coefficient of determination, properties. Concept of Multiple regression and Logistic regression. | 15 |

**References**:
1. Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.
2. Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi

**Additional References:**
1. Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentice Hall of India, New Delhi.
2. Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi.
3. Purohit, S. G., Gore S. D., Deshmukh S. R. (2008). Statistics Using R, Narosa Publishing House, New Delhi.
4. Schaum's Outline Of Theory And Problems Of Beginning Statistics, Larry J. Stephens, Schaum's Outline Series McGraw-Hill. 2009

**COURSE CODE: U23CS1MIP01**                          **COURSE CREDIT: 01**

**1 credit - 2 lectures**

**1 lecture is 60 minutes.**

| Sr. No. | List of Practical |
|---|---|
| | **Problem solving and implementation using R Studio** |
| 1 | **Basics of R-** <br> a. Data input, Arithmetic Operators <br> b. Vector Operations, Matrix Operations <br> c. Data Frames, Built-in Functions <br> d. Frequency Distribution, Grouped Frequency Distribution <br> e. Diagrams and Graphs |
| 2 | **Frequency distribution and data presentation-** <br> a. Frequency Distribution (Univariate data/ Bivariate data) <br> b. Diagrams <br> c. Graphs |
| 3 | **Measures of Central Tendency-** <br> a. Arithmetic Mean <br> b. Median <br> c. Mode <br> d. Partition Values |
| 4 | **Measures dispersion-** <br> a. Range and Coefficient of range <br> b. Quartile deviation and Coefficient of quartile deviation <br> c. Standard deviation, Variance and Coefficient of variation (C.V.) |
| 5 | **Moments-** <br> a. Raw moments <br> b. Central moments |
| 6 | **Measures of Skewness -** <br> a. Karl Pearson's measure of Skewness <br> b. Bowley's measure of Skewness <br> c. Moment coefficient of Skewness |
| 7 | **Measures of Kurtosis-** <br> a. Moment coefficient of Kurtosis (Absolute measure) <br> b. Moment coefficient of Kurtosis (Relative measure) |
| 8 | **Correlation-** <br> a. Karl Pearson's correlation coefficient <br> b. Spearman's Rank correlation |

| 9 | **Regression-** <br> a. Method of least squares <br> b. Using regression coefficients <br> c. Properties of regression lines & regression coefficients |
|---|---|
| 10 | **Summary Statistics using R-** <br> a. Summary statistics for raw data <br> b. Summary statistics for grouped frequency distribution <br> c. Simple Correlation & Regression using R |

# Basics of Web Programming

**COURSE CODE: U23CS1VSCP01**                    **COURSE CREDIT: 01**

**2 credits - 60 lectures**
**1 lecture is 60 minutes.**

**Course Objectives:**
- To know the use of HTML, CSS, JavaScript in designing Web pages.

**Course Outcomes:**
- Ability to design and develop Web Pages using HTM, CSS and JavaScript.

| Sr. No | List of Practical |
|---|---|
| 1 | Design a webpage that makes use of<br>a. Document Structure Tags<br>b. Various Text Formatting Tags<br>c. List Tags<br>d. Image and Image Maps |
| 2 | Design a webpage that makes use of<br>a. Table tags<br>b. Form Tags (forms with various form elements)<br>c. Navigation across multiple pages<br>d. Embedded Multimedia elements |
| 3 | Create an HTML page using tags to accomplish the following:<br>a. A paragraph containing text "All that glitters is not gold". Bold face and italicize this text<br>b. Create equation:<br>$$x = 1/3(y1^2 + z1^2)$$<br>c. Put a background image to a page and demonstrate all attributes of background image<br>d. Create unordered list of 5 fruits and ordered list of 3 flowers |
| 4 | Create the following table using HTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary<br> |
| 5 | Use HTML5 for performing following tasks:<br>a. Draw a square using HTML5 SVG , fill the square with green color and make 6px brown stroke width<br>b. Write the following mathematical expression by using HTML5 MathML :    $d=x^2-y^2$<br>c. Redirecting current page to another page after 5 seconds using HTML5 meta tag |
| 6 | Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>, <figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives information about travel experience |

| | |
|---|---|
| 7 | Design a webpage that make use of Cascading Style Sheets with<br>a. CSS properties to change the background of a Page.<br>b. CSS properties to change Fonts and Text Styles<br>c. CSS properties for positioning an element |
| 8 | Using CSS<br>a. Create a class called income, and make it a background color of #0ff.<br>b. Create a class called expenses, and make it a background color of #f0f.<br>c. Create a class called profit, and make it a background color of #f00.<br>d. Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text.<br>e. Further create following line of text in the same document: The current price is 50₹ and new price is 40₹ |
| 9 | Using CSS<br>a. Change the tag li to have the following properties:<br>☐ A display status of inline<br>☐ A medium, double-lined, black border<br>☐ No list style type<br>b. Add the following properties to the style for li:<br>☐ Margin of 5px<br>☐ Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px to the left |
| 10 | a. Using JavaScript design, a web page that prints factorial/Fibonacci series/any given series.<br>b. Design a form and validate all the controls placed on the form using Java Script.<br>c. Write a JavaScript program to display all the prime numbers between 1 and 100. |
| 11 | a. Write a JavaScript program to accept a number from the user and display the sum of its digits.<br>b. Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).<br>c. Write a java script program to design simple calculator. |
| 12 | Using JavaScript<br>a. Design a web page demonstrating different conditional statements.<br>b. Design a web page demonstrating different looping statements. |
| 13 | Design a web page demonstrating different Core JavaScript references (Array, Boolean, Date, Function, Math, Number, Object, String, regExp). |
| 14 | Write JavaScript code for<br>a. Finding Palindrome numbers<br>b. Calculating reverse of a number<br>c. Displaying the following pattern<br><pre>        *
      *   *
    *    *    *</pre>d. Displaying the following pattern<br><pre>      *
     **
    ****
    ******</pre> |
| 15 | Write JavaScript code for Validating the various Form Elements |
| 16 | Write JavaScript code for<br>a. Demonstrating different JavaScript Objects such as Window, Navigator, History, Location, Document,<br>b. Storing and Retrieving Cookies |

# Computer Organization

**COURSE CODE: U23CS1SEC01**                                    **COURSE CREDIT: 01**
**1 credit -15 lectures**
**1 lecture is 60 minutes.**

**Course Objectives:**
- To understand the structure and operation of modern processors and their instruction sets.

**Course Outcomes:**
- To understand basics of digital electronics needed for computers and how data is transferred between the processor and I/O devices.

| Unit | Syllabus | No. of Lectures |
|------|----------|------|
| 1 | **Computer Abstractions and Technology:** Basic structure and operation of a computer, functional units and their interaction. Representation of numbers and characters.<br>**Logic circuits and functions:** Combinational circuits and functions: Basic logic gates and functions, truth tables; logic circuits and functions. Minimization with Karnaugh maps. Synthesis of logic functions with and-or-not gates, Nand gates, nor gates. Fan-in and fan-out requirements; tristate buffers. Half adder, full adder, ripple carry adder. (Flip flops) Gated S-R and D latches, edge-triggered D latch. Shift registers and registers. Decoders, multiplexers.<br>**Sequential circuits and functions:** State diagram and state table; finite state machines and their synthesis.<br>**Instruction set architectures:** Memory organization, addressing and operations; word size, big-endian and little-endian arrangements. Instruction sets.<br>**Basic Processor Unit:** Main components of a processor: registers and register files, ALU, control unit, instruction fetch unit, interfaces to instruction and data memories | 15 |

**References:**
1. Carl Hamacher et al., Computer Organization and Embedded Systems, 6 ed.,    McGraw-Hill 2012

**Additional References:**

1. Patterson and Hennessy, Computer Organization and Design, Morgan Kaufmann, ARM Edition, 2011
2. R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd. , 4th Edition, 2010

**COURSE CODE: U23CS1SECP01**                                    **COURSE CREDIT: 01**

**1 credit - 2 lectures**

**1 lecture is 60 minutes.**

| Sr. No, | List of Practical |
|---------|-------------------|
| 1 | Study and verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, and EX-NOR). |
| 2 | Simplify given Boolean expression and realize it. |
| 3 | Design and verify a half/full adder |
| 4 | Design and verify half/full subtractor |
| 5 | Design a 4-bit magnitude comparator using combinational circuits. |
| 6 | Design and verify the operation of flip-flops using logic gates. |
| 7 | Verify the operation of a counter. |
| 8 | Verify the operation of a 4-bit shift register |
| 9 | Using SPIM, write and test an adding machine program that repeatedly reads in integers and adds them into a running sum. The program should stop when it gets an input that is 0, printing out the sum at that point. |
| 10 | Using SPIM, write and test a program that reads in a positive integer using the SPIM system calls. If the integer is not positive, the program should terminate with the message "Invalid Entry"; otherwise the program should print out the names of the digits of the integers, delimited by exactly one space. For example, if the user entered "528," the output would be "Five Two Eight." |

# Practical No. 1 to 8 can be performed using any open-source simulator (like Logisim)
(Download it from https://sourceforge.net/projects/circuit/)
# Practical No. 9 and 10 are required to be done using SPIM. SPIM is a self-contained simulator that will run MIPS R2000/R3000 assembly language programs.
# Latest version is available at https://sourceforge.net/projects/spimsimulator/

# Indian Astronomy

**COURSE CODE: U23CS1IKS01**                           **COURSE CREDIT: 02**

**1 credit - 15 Hours**

**1 lecture is 60 minutes.**

**Course Objectives:**
- To develop an awareness among learners about the Indian Astronomy.
- To make learners proficient in the concept, technicalities and computational procedures developed by Indian mathematician and astronomers.

**Course Outcomes:**
- To understands basics of Indian Astronomy.
- To Understand Coordinate Systems, Rasi & Nakshatra systems.

| Unit | Syllabus | No. of Lectures |
|---|---|---|
| 1. | **Introduction**: Ancient Indian Astronomy, The Vedic Period, Siddhanta, Aryabhata, Astronomers after Aryabhata, Contents of Siddhantaas, Continuity in Astronomical Tradition Celestial Sphere: Introduction, Diurnal Motion of Celestial Bodies, Motion of Celestial Bodies Relative to Stars, Celestial Horizon, Meridian, Pole Star and Directions, Zodiac and Constellations, Equator and Poles (Visuvad vṛtta and Dhruva), Latitude of a Place and Altitude of Pole Star, Ecliptic and the Equinoxes | 15 |
| 2 | **Co-ordinate Systems**: Introduction, Celestial Longitude and Latitude (Ecliptic System), Right Ascension and Declination (Equatorial System), Azimuth and Altitude (Horizontal System), Hour Angle and Declination (Meridian System), Phenomenon of Precession of Equinoxes, Ancient Indian References to the Precession, Effects of Precession on Celestial Longitude Tropical (Sayana) and Sidereal (Nirayana) Longitudes<br>**Rasi and Naksatra Systems**: Zodiac and Rasis, Nakṣatra System<br>**Time in Indian Astronomy**: Introduction, Civil Day and Sidereal Day, Solar Year and Civil Calendar, Solar Month and Lunar Month, Luni-Solar Year (or Lunar Year), Adhikamāsa and Ksayamāsa, Yuga System. Indian Eras, Time on a Microcosmic Scale | 15 |

**Reference:**
1. Indian Astronomy: An Introduction by S Balachandra Rao, University Press 2000
2. Mathematics in Ancient and Medieval India by A K Bag, Orientilia Delhi. 1979

# Environmental Studies

**COURSE CODE: U23CS1VEC01**                        **COURSE CREDIT: 02**

**1 credit - 15 lectures**

**1 lecture is 60 minutes.**

**Course Objectives:**
- Understand key concepts of environmental studies. ecosystems and natural resources.
- Understand the role of communities in environmental management, use computing effectively by applying concepts of green computing.

**Course Outcomes:**
- To understand environmental policies and practices.
- To develop ethical values towards the environment conservation

| Unit | Syllabus | No. of lectures |
|------|----------|-----------------|
| 01 | **Introduction** The Multidisciplinary Nature of Environmental Studies, Components of the Environment, Scope and Importance of Environmental Studies, Concept of Sustainability and Sustainable Development.<br>**Ecosystems and Natural Resources** Overview of Ecosystems, Structure and Function of Ecosystems, Energy Flow in Ecosystem, Food Chain, Food Web and Ecological Succession, Case Studies of Ecosystems, Degradation of Ecosystems, Renewable and Non-Renewable Resources, Deforestation, Role of an Individual in the Conservation of Natural Resources. | 15 |
| 02 | **Human Communities and the Environment** Human Population and Growth, Carbon Footprint, Resettlement and Rehabilitation of Project-Affected Persons, Disaster Management, Environmental Movements, Environmental Ethics, Environmental Communication and Public Awareness, Visit to Local Area to Document Environmental Assets.<br>**Green Computing** Overview of Green Computing, Green Computing Efforts, Going Paperless, Power Measurement and Power Reduction, Electronic Waste, Recycling of Electronic Waste, Green Supply Chain, Certifications for Green Computing | 15 |

**References:**
1. Bharucha Erach, "Textbook of Environmental Studies for Undergraduate Courses", Universities Press 2005

**Additional References**

1. Hawkins R.E., "Encyclopedia of Indian Natural History", Bombay Natural History Society, Bombay 1986
2. Kaushik A., " Perspectives in Environmental Studies", New Age International Publication, New Delhi 2006
2. Jadhav, H &Bhosale, "Environmental Protection and Laws", Himalaya Pub. House, Delhi 2015

# SCHEME OF THEORY EXAMINATION

## I. MAJOR AND MINOR

**The scheme of examination shall be divided into two parts:**
- **Internal assessment 40% i.e. 40 marks**
- **Semester end examination 60% i.e. 60 marks**

**(A) Internal Assessment 40 marks**

| Description | Marks |
|---|---|
| Internal test of 20 marks<br>Q.1 Multiple choice Questions / True or False - 10 Marks<br>Q.2 Attempt 2 questions out of 3 questions (5 marks each)- 10 Marks | 20 |
| One Project and Viva voce / Presentation / Case studies / Assignments Poster Making / Quiz / Role Play / Subject Specific Activities | 15 |
| Attendance and Class behavior | 05 |
| **Total** | 40 |

**(B) Semester end examination 60 marks**

**PAPER PATTERN**

| Duration: 2 hours | | | |
|---|---|---|---|
| Total Marks: 60 | | | |
| All Questions are Compulsory | | | |
| **Question** | **Based on** | **Options** | **Marks** |
| Q. 1 | Unit 1 | A OR B / A OR B | 15 |
| Q. 2 | Unit 2 | A OR B / A OR B | 15 |
| Q. 3 | Unit 3 | A OR B / A OR B | 15 |
| Q. 4 | Unit 1,2,3 | A OR B / A OR B | 15 |
| Total | | | 60 |

**Note**:
1. Q.1, 2, 3 and 4 may be divided into sub questions with internal choice if required.

- **Passing criteria: Minimum 40% in Internal (16 out of 40) and 40% (24 out of 60) in semester end examination.**

## II. VOCATIONAL COURSE (VSC) & SKILL ENHANCEMENT COURSE (SEC)

**The scheme of examination shall be divided into two parts:**

- **Internal assessment 40% i.e.  20 marks**
- **Semester end examination 60% i.e. 30 marks**

**(A) Internal Assessment 20 marks**

| Description | Marks |
|---|---|
| **Internal test**<br>Q.1 Multiple choice Questions/True or False -  5 Marks<br>Q.2. Attempt 1 question out of 3 questions- 5 Marks | 10 |
| Assignments / Presentation / Poster / Subject Specific Activities | 5 |
| Attendance and Class behavior | 5 |
| Total | 20 |

**B) Semester end examination 30 marks**

**PAPER PATTERN**

| Duration: 1 hours | |
|---|---|
| Total Marks: 30 | |
| **Description** | **Marks** |
| Q.1 10 marks OR 10 marks | 10 |
| Q.2 10 marks OR 10 marks | 10 |
| Q.3 10 marks OR 10 marks | 10 |
| Total | 30 |
| Note:<br>1. Q.1, 2, 3 may be divided into sub questions if required.<br>2. Q.3 May include theory (short notes) /Case Study in one of the options. | |

**Passing criteria: Minimum 40% in Internal (8 out of 20) and 40% (12 out of 30) in semester end examination.**

## III. ABILITY ENHANCEMENT COURSE(AEC) / VALUE EDUCATION COURSE (VEC) / INDIAN KNOWLEDGE SYSTEM (IKS)

**The scheme of examination shall be divided into two parts:**
- **Internal assessment 40% i.e. 20 marks**
- **Semester end examination 60% i.e. 30 marks**

## Question Paper Pattern

**(A) Internal Assessment: Total 20 Marks**

| Description | Marks |
|---|---|
| Internal Test<br><br>Q.1 Multiple choice Questions/True or False -  5 Marks<br>Q.2. Attempt 1 question out of 3 questions- 5 Marks | 10 Marks |
| Assignment/Presentation/Group Discussion/Role Play/Mock Interviews / Subject Specific Activities | 05 Marks |
| Attendance | 05 Marks |

**(B) Theory Exam, Total Marks: 30 Marks**

| Description | Marks |
|---|---|
| A) Descriptive Question<br>OR<br> B) Short Notes 2 out of 3 (5 Marks each)<br>From Unit 1 | 10 Marks |
| A) Descriptive Question<br>OR<br> B) Short Notes 2 out of 3 (5 Marks each)<br>From Unit 2 | 10 Marks |
| A) Descriptive Question<br>OR<br> B) Short Notes 2 out of 3 (5 Marks each)<br>From Unit 1,2 | 10 Marks |

# SCHEME OF PRACTICAL EXAMINATION

**The scheme of Practical examination shall be**
- Practical assessment carries 50 Marks : 40 marks + 05 marks (journal)+ 05 marks(viva)
- Minimum 75 % practical are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam)


**(A) Practical Assessment 50 marks**

| Description | Marks |
|---|---|
| Two questions of practical (20 marks each) | 40 |
| Journal | 5 |
| Viva | 5 |
| Total | 50 |


**Passing criteria: Minimum 40% in Practical (20 out of 50)**