

Course Code	Applied Physics		L	T	P	C
20ABS9902			3	0	0	3
Pre-requisite	Basics of Physics	Semester	I - II			
<b>Course Outcomes (CO):</b>						
<p><b>CO1:</b> Analyze the intensity variation of light due to interference and diffraction &amp; illustrate the propagation of electromagnetic waves.</p> <p><b>CO2:</b> Analyze and apply the concepts of LASER S and optical fibers.</p> <p><b>CO3:</b> Infer the properties of dielectric magnetic material</p> <p><b>CO4:</b> Apply the fundamentals of semi conductors for device applications</p> <p><b>CO5:</b> Implement the behavior of superconductors in diverse fields &amp; interpret the properties of nanomaterials for multiple applications.</p>						
<b>UNIT - I</b>			10 Hrs			
<b>Optics</b>						
Interference of light -principle of superposition-Conditions for sustained Interference-Interference in thin films (reflected light) - Newton's Rings -Determination of Wavelength. Diffraction-Fraunhofer diffraction- Single slit and double slit- Diffraction Grating. Divergence and Curl of Electric and Magnetic Fields - Gauss' theorem for divergence and Stokes' theorem for curl - Maxwell's Equations (Quantitative) – Electromagnetic wave - propagation in non-conducting medium - Poynting's Theorem.						
<b>UNIT - II</b>			10 Hrs			
<b>Lasers and Fiber Optics</b>						
Lasers – Introduction – Characteristics – Spontaneous and Stimulated Emission – Einstein Coefficients – Population Inversion – Excitation Mechanism and Optical Resonator - He-Ne Laser -Nd: YAG Laser – Semiconductor Diode Laser – Applications of Lasers and Holography. Introduction to Optical Fibers – Total Internal Reflection – Critical angle of propagation –Acceptance angle – Numerical Aperture – Classification of fibers based on Refractive index profile – Propagation of electromagnetic wave through optical fiber – modes – importance of V-number-Attenuation, Block Diagram of Fiber optic Communication – Industrial Applications						
<b>UNIT - III</b>			8 Hrs			
<b>Dielectric and Magnetic Materials</b>						
Introduction—Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant-Types of polarizations: Electronic and Ionic,(Quantitative), Orientation Polarizations (Qualitative)- Frequency dependence of polarization-Lorentz (internal) field-Claussius-Mosotti equation-Applications of Dielectrics: Ferroelectricity. Introduction-Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment – Classification of Magnetic materials - Weiss theory of ferromagnetism (qualitative) – Hysteresis– soft and hard magnetic materials – Magnetic memory device applications .						
<b>UNIT - IV</b>			8 Hrs			
<b>Semiconductors</b>						
Origin of Energy bands (Qualitative)-Intrinsic and Extrinsic semiconductors –Direct and indirect band gap semiconductors- Density of charge carriers – Fermi energy--Dependence of Fermi energy on carrier concentration and temperature – Electrical conductivity – Drift and Diffusion currents – Continuity equation - Hall effect - Applications of Hall effect and Semiconductors.						
<b>UNIT - V</b>			10 Hrs			
<b>Superconductors and Nonmaterial's</b>						
Superconductors-Properties-Meissner's effect-BCSTheory(Qualitative) - Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors. Nanomaterials–Significance of nanoscale–: Physical, Mechanical, Magnetic, Optical properties of nanomaterials – Synthesis of nanomaterials:Top-down-Ball Milling, Bottom-up-Chemical vapour deposition–Characterization of nanomaterials : X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM)-Applications of Nanomaterials.						
<b>Textbooks:</b>						
<ol style="list-style-type: none"> <li>1. M. N. Avadhanulu, P. G. Kshirsagar &amp;TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications,11th Edition2019.</li> <li>2. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning,2012.</li> </ol>						
<b>Reference Books:</b>						
<ol style="list-style-type: none"> <li>1. K Thyagarajan "Engineering Physics",-Mc Graw Hill Publishing Company Ltd, 2016</li> <li>2. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018</li> <li>3. David J.Griffiths,"Introduction to Electrodynamics"-4/e, Pearson Education, 2014</li> <li>4. T Pradeep, "A Text book of NanoScience and NanoTechnology"-Tata Mc Graw Hill 2013.</li> </ol>						
<b>Online Learning Resources:</b>						

**Mapping of course outcomes with program outcomes**

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

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

AIITS TPT. CSE (DS)

<b>Course Code</b>	<b>Probability And Statistics</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
20ABS9911					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Pre-requisite</b>	<b>Probability</b>	<b>Semester</b>			<b>I - II</b>			
<b>Course Outcomes (CO):</b>								
<b>CO1:</b> Interpret the characteristics through correlation and regression tools. <b>CO2:</b> Make use of the concepts of probability and their applications. <b>CO3:</b> Apply discrete and continuous probability distributions. <b>CO4:</b> Inference the components of a classical hypothesis test for large sample <b>CO5:</b> Inspect the components of a classical hypothesis test for small samples.								
<b>UNIT - I</b>					10 Hrs			
<b>Descriptive statistics and methods for data science</b>								
Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines								
<b>UNIT - II</b>					8 Hrs			
<b>Probability</b>								
Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.								
<b>UNIT - III</b>					8 Hrs			
<b>Probability distributions</b>								
Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties.								
<b>UNIT - IV</b>					8 Hrs			
<b>Estimation and Testing of hypothesis, large sample tests</b>								
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems								
<b>UNIT - V</b>					8 Hrs			
<b>Small sample tests</b>								
Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi^2$ - test for goodness of fit.								
<b>Textbooks:</b>								
1. Miller and Friends, Probability and Statistics for Engineers, 7/e, Pearson, 2008. 2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.								
<b>Reference Books:</b>								
1. S. Chand ,Probability and Statistics, Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad 2. S. Ross, a First Course in Probability, Pearson Education India, 2002. 3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.								
<b>Online Learning Resources:</b>								
www.nptel.ac.in								

**Mapping of course outcomes with program outcomes**

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

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

Course Code	Communicative English		L	T	P	C
20AHS9901			3	0	0	3
Pre-requisite	Grammar and Literature	Semester	I - II			
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers</li> <li>Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials</li> <li>Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations</li> <li>Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information</li> <li>Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing</li> </ul>						
<b>Course Outcomes (CO):</b>						
<p><b>CO1:</b> Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.</p> <p><b>CO2:</b> Apply grammatical structures to formulate sentences and correct word forms</p> <p><b>CO3:</b> Analyze discourse markers to speak clearly on a specific topic in informal discussions</p> <p><b>CO4:</b> Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.</p> <p><b>CO5:</b> Create a coherent paragraph interpreting a figure/graph/chart/table</p>						
<b>UNIT - I</b>					9 Hrs	
<p><b>Lesson:</b> On the Conduct of Life: William Hazlitt</p> <p><b>Listening:</b> Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.</p> <p><b>Speaking:</b> Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.</p> <p><b>Reading:</b> Skimming to get the main idea of a text; scanning to look for specific pieces of information.</p> <p><b>Writing:</b> Beginnings and endings of paragraphs – introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.</p> <p><b>Grammar and Vocabulary- I :</b> Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form – Wh questions; word order in sentences.</p> <p><b>Vocabulary -2: Formal/academic words and phrases.</b></p>						
<b>UNIT - II</b>					9 Hrs	
<p><b>Lesson: The Brook: Alfred Tennyson</b></p> <p><b>Listening:</b> Answering a series of questions about main idea and supporting ideas after listening to audio texts.</p> <p><b>Speaking:</b> Discussion in pairs/small groups on specific topics followed by short structured talks.</p> <p><b>Reading:</b> Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.</p> <p><b>Writing:</b> Paragraph writing (specific topics) using suitable cohesive devices;</p> <p><b>Mechanics of writing</b> – punctuation, capital letters.</p> <p><b>Grammar &amp; Vocabulary building-1:</b> Cohesive devices – linkers, sign posts and transition signals; use of articles and zero article; prepositions.</p> <p><b>Vocabulary building: 2 Idioms and Phrases, Homonyms, Homophones and Homographs.</b></p>						
<b>UNIT - III</b>					9 Hrs	
<p><b>Lesson: The Death Trap: Saki</b></p> <p><b>Listening:</b> Listening for global comprehension and summarizing what is listened to.</p> <p><b>Speaking:</b> Discussing specific topics in pairs or small groups and reporting what is discussed</p> <p><b>Reading:</b> Reading a text in detail by making basic inferences – recognizing and interpreting specific context clues; strategies to use text clues for comprehension.</p> <p><b>Writing: Summarizing</b> – identifying main idea/s and rephrasing what is read.</p> <p><b>Grammar and Vocabulary building-II:</b> Direct and indirect speech, reporting verbs for academic purposes.</p> <p><b>Technical Writing-1:</b> personal experiences, unforgettable incidents, travelogues. (Imaginative, Narrative and Descriptive)</p>						
<b>UNIT - IV</b>					9 Hrs	
<p><b>Lesson: Innovation: Muhammad Yunus</b></p> <p><b>Listening:</b> Making predictions while listening to conversations/ transactional dialogues without video; listening with video.</p> <p><b>Speaking:</b> Role plays for practice of conversational English in academic contexts (formal and informal) – asking for and giving information/directions</p> <p><b>Reading:</b> Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.</p> <p><b>Writing: Letter Writing:</b> Official Letters/Report writing, <i>e-mail writing</i></p> <p><b>Grammar and Vocabulary:</b> Quantifying expressions – adjectives and adverbs; comparing and contrasting; Voice – Active &amp; Passive Voice.</p> <p><b>Vocabulary:2 :</b> Jigsaw Puzzles, Vocabulary Activities through Web tools</p>						

<b>UNIT – V</b>	9 Hrs
<b>Lesson: Politics and the English Language: George Orwell</b>	
<b>Listening:</b> Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.	
<b>Speaking:</b> Formal oral presentations on topics from academic contexts – without the use of PPT slides.	
<b>Reading:</b> Reading for comprehension.	
<b>Writing:</b> Writing structured essays on specific topics using suitable claims and evidences.	
<b>Grammar and Vocabulary:</b> Editing short texts –identifying and correcting common errors in grammar and usage.	
<b>Technical Writing-2:</b> Narrative short story, News paper articles on science fiction.	
<b>Textbooks:</b>	
1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.</li> <li>Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2<sup>nd</sup> Edition, 2018.</li> <li>Raymond Murphy’s English Grammar in Use Fourth Edition (2012) E-book</li> <li>Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.</li> <li>Oxford Learners Dictionary, 12<sup>th</sup> Edition, 2011</li> <li>Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)</li> <li>Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler</li> </ol>	
<b>Online Learning Resources:</b>	
<ol style="list-style-type: none"> <li><a href="http://www.englishclub.com">www.englishclub.com</a></li> <li><a href="http://www.easyworldofenglish.com">www.easyworldofenglish.com</a></li> <li><a href="http://www.languageguide.org/english/">www.languageguide.org/english/</a></li> <li><a href="http://www.bbc.co.uk/learningenglish">www.bbc.co.uk/learningenglish</a></li> <li><a href="http://www.eslpod.com/index.html">www.eslpod.com/index.html</a></li> <li><a href="http://www.myenglishpages.com">www.myenglishpages.com</a></li> </ol>	

**Mapping of course outcomes with program outcomes**

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

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

Course Code	Data Structures		L	T	P	C
20AES0502			3	0	0	3
Pre-requisite	C Programming, Mathematics	Semester	I - II			
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>To teach the representation of solution to the problem using algorithm</li> <li>To explain the approach to algorithm analysis</li> <li>To introduce different data structures for solving the problems</li> <li>To demonstrate modelling of the given problem as a graph</li> <li>To elucidate the existing hashing techniques</li> </ul>						
<b>Course Outcomes (CO):</b>						
<b>CO1:</b> Analyze and evaluate the efficiency of an algorithm <b>CO2:</b> Implement linear data structures <b>CO3:</b> implement non-linear data structures <b>CO4:</b> Solve the problem of efficiently using graphs and Hashing techniques <b>CO5:</b> Implement advanced sorting and organizing the file						
<b>UNIT - I</b>						9 Hrs
<b>Introduction</b>						
Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort						
<b>UNIT - II</b>						9 Hrs
<b>Stack, Queue and Linked lists</b>						
Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.						
<b>UNIT - III</b>						9 Hrs
<b>Trees</b>						
Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: B- Trees, B + Trees.						
<b>UNIT - IV</b>						9 Hrs
<b>Graphs and Hashing</b>						
The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure						
Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.						
<b>UNIT - V</b>						9 Hrs
<b>Files and Advanced sorting</b>						
File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization. Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.						
<b>Textbooks:</b>						
<ol style="list-style-type: none"> <li>Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2<sup>nd</sup> Edition, Galgotia Book Source, Pvt. Ltd., 2004.</li> <li>Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.</li> </ol>						
<b>Reference Books:</b>						
<ol style="list-style-type: none"> <li>D. Samanta, "Classic Data Structures", 2<sup>nd</sup> Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.</li> <li>Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016</li> <li>Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.</li> </ol>						
<b>Online Learning Resources:</b>						
www.nptel.ac.in						

**Mapping of course outcomes with program outcomes**

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

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

Course Code	Python Programming		L	T	P	C
20AES0509			1	0	4	3
Pre-requisite	Problem Solving and Programming	Semester	I - II			
<b>Course Outcomes (CO):</b>						
<p><b>CO1:</b> Understand the Python syntax, semantics, basic programming constructs to be used to write the programs</p> <p><b>CO2:</b> Utilize the methods of various data structures to manipulate the data</p> <p><b>CO3:</b> Apply various packages to work with real need</p> <p><b>CO4:</b> Apply the appropriate Object-Oriented Programming principle for a given scenario</p> <p><b>CO5:</b> Develop bug free applications by handling different types of exceptions</p>						
<b>UNIT - I</b>			9 Hrs			
<p><b>Basics of Python Programming:</b> Features and applications of Python, Comparison with C, Literals, variables and identifiers, data types, comments, reserved words, indentation, operators, Input and Output Statements, type conversion.</p> <ul style="list-style-type: none"> <li>Write a program to demonstrate different representations of numbers in Python.</li> <li>Write a program to perform different Operations on operators in Python</li> </ul>						
<b>UNIT - II</b>			9 Hrs			
<p><b>Decision Control Statements:</b> Introduction, selection/conditional branching statements, basic loop structures/iterative statements, nested loops, break, continue and pass statements, else statement used with loops.</p> <p><b>Strings:</b> operations and methods, Lists: accessing and updating values in list, nested and cloning lists, basic list operations, list methods, list comprehensions, looping in lists, Tuples, Sets, Dictionaries and Operations.</p> <ul style="list-style-type: none"> <li>Develop programs to demonstrate decision making and looping structures in python.</li> <li>Write a program to create, append, and remove lists in Python.</li> <li>Write a program to demonstrate working with tuples in python.</li> <li>Write a program to demonstrate working with dictionaries in python.</li> </ul> <p><b>Case study on Loops:</b></p> <ul style="list-style-type: none"> <li>A perfect number is a number for which the sum of its proper divisors is exactly equal to the number. For example, the sum of the proper divisors of 28 would be <math>1 + 2 + 4 + 7 + 14 = 28</math>, which means that 28 is a perfect number. A number <math>n</math> is called deficient if the sum of its proper divisors is less than <math>n</math> and it is called abundant if this sum exceeds <math>n</math>. Write a program for the given large <math>n</math>, find the sum of all perfect numbers, sum of all deficient numbers and sum of abundant numbers separately. Print all perfect numbers along with its sum, deficient numbers along with its sum and abundant numbers along with its sum.</li> </ul>						
<b>UNIT - III</b>			9 Hrs			
<p><b>Functions:</b> Introduction, Declaration and definition, calling a function, returning values from function, pass by object reference, arguments, Local and Global variables, recursive functions, lambda functions, fruitful functions.</p> <p><b>Libraries:</b> NumPy, pandas, Keras.</p> <ul style="list-style-type: none"> <li>Develop Python programs using recursive and non-recursive functions</li> <li>Write a program to demonstrate a) arrays b) array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy</li> </ul> <p><b>Case study on Functions:</b></p> <ul style="list-style-type: none"> <li>Write a function <code>mult_lists(a, b)</code> that takes two lists of numbers of the same length, and returns the sum of the products of the corresponding elements of each.</li> </ul>						
<b>UNIT - IV</b>			9 Hrs			
<p><b>Classes and Objects:</b> Introduction, classes and objects, constructor, encapsulation, Class method and self-argument, <code>__init__()</code> method, class variables and object variables, <code>__del__()</code> method, other special method, public and private data members, private methods, built-in class functions and attributes, overloading methods, overriding methods.</p> <ul style="list-style-type: none"> <li>Write a program to demonstrate how to create classes and objects in the application.</li> </ul> <p><b>Case study on Classes</b></p> <ul style="list-style-type: none"> <li>Design a class named QuadraticEquation for a quadratic equation <math>ax^2+bx+c=0</math>. The class contains: <ul style="list-style-type: none"> <li>The private data fields <math>a, b, c</math> that represents three coefficients.</li> <li>A constructor for the arguments for <math>a, b</math> and <math>c</math></li> <li>Three get methods for <math>a, b</math> and <math>c</math></li> <li>A method named <code>getDiscriminant()</code> that returns the discriminant, which is <math>b^2-4ac</math>.</li> <li>The methods named <code>getRoot1()</code> and <code>getRoot2()</code> for returning the two roots of the equation using the formulas:  <math>R_1 = -b + (\sqrt{b^2-4ac})/2a</math> and <math>R_2 = -b - (\sqrt{b^2-4ac})/2a</math>.</li> <li>These methods are useful only if the discriminant is non negative. Let these methods return 0 if the discriminant is negative.</li> <li>Write a test program that prompts the user to enter values for <math>a, b, c</math> and displays the result based on discriminant.</li> </ul> </li> </ul>						

<b>UNIT – V</b>	9 Hrs
<p><b>Inheritance:</b> Introduction, inheriting classes in python, types of inheritance, complex objects, abstract classes and interfaces. <b>Error and Exception Handling:</b> Types of Errors, Exceptions, Handling Exceptions, types of exceptions</p> <p><b>Files &amp; Database:</b> Introduction to File Input and Output, Using Loops to Process Files, Introduction to database, standard methods, working with oracle database, case study (create employees table in the oracle database).</p> <ul style="list-style-type: none"> <li>Develop Python programs to exemplify the concepts of inheritance and overloading.</li> <li>Write a program to create user defined exception and handle the exception in the application.</li> </ul> <p><b>Case study on Files</b></p> <ul style="list-style-type: none"> <li>Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be the input that to be written to the second file.</li> </ul>	
<b>Textbooks:</b>	
<ol style="list-style-type: none"> <li>Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.</li> <li>Reema thareja, Python Programming using problem solving approach, Oxford University Press.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>Dietel and Dietel, Python How to Program.</li> <li>Kenneth A. Lambert, B.L. Juneja, Fundamentals of Python, Cengage Learning</li> <li>James Payne, Beginning Python using Python2.6 and Python3</li> </ol>	
<b>Online Learning Resources:</b>	
<ol style="list-style-type: none"> <li><a href="https://www.python.org">https://www.python.org</a></li> <li><a href="https://learnpython.org">https://learnpython.org</a></li> </ol>	

**Mapping of course outcomes with program outcomes**

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

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



<b>Course Code</b>	<b>Communicative English Lab</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
20AHS9902			<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>Pre-requisite</b>	<b>Language and Grammar</b>	<b>Semester</b>	<b>I - II</b>			
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>Students will be exposed to a variety of self instructional, learner friendly modes of language learning.</li> <li>Students will learn better pronunciation through Phonetics.</li> <li>Students will be trained to use language effectively to face interviews, group discussions, public speaking .</li> <li>Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.</li> </ul>						
<b>Course Outcomes (CO):</b>						
<p><b>CO1:</b> Create Awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English</p> <p><b>CO2:</b> Understanding the different aspects of the language with emphasis on LSRW skills and make use of different strategies in discussion</p> <p><b>CO3:</b> Improve word knowledge and apply skills in various languages learning activities</p> <p><b>CO4:</b> Analyze speech sounds, stress ,rhythm, intonation and syllable division for better listening and speaking comprehension</p> <p><b>CO5:</b> Evaluate and exhibit acceptable etiquette essential in social and professional presentations.</p>						
<b>UNIT – I</b>			9 Hrs			
<ol style="list-style-type: none"> <li>Phonetics</li> <li>Non - verbal communication</li> <li>Vocabulary (word formation, one word substitutes, words often misused &amp; confused, collocations idioms &amp; phrases)</li> </ol>						
<b>UNIT – II</b>			9 Hrs			
<ol style="list-style-type: none"> <li>Reading Comprehension</li> <li>JAM</li> <li>Distinction between Native and Indian English accent (Speeches by TED and Kalam).</li> </ol>						
<b>UNIT – III</b>			9 Hrs			
<ol style="list-style-type: none"> <li>Situational dialogues/ Giving Directions</li> <li>Describing objects/places/persons</li> </ol>						
<b>UNIT – IV</b>			9 Hrs			
<ol style="list-style-type: none"> <li>Fun – Buzz (Tongue twisters, riddles, puzzles etc)</li> <li>Formal Presentations</li> </ol>						
<b>UNIT – V</b>			9 Hrs			
<ol style="list-style-type: none"> <li>Debate (Contemporary / Complex topics)</li> <li>Group Discussion</li> </ol>						
<b>Software Source:</b>						
K-Van Solutions Software						
<b>Reference Books:</b>						
Teaching English - British Council						

**Mapping of course outcomes with program outcomes**

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

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

<b>Course Code</b>	<b>Applied Physics Lab</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
20ABS9907					<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>Pre-requisite</b>	<b>Basic of Physics</b>	<b>Semester</b>		<b>I - II</b>				
<b>Course Outcomes (CO):</b>								
<ul style="list-style-type: none"> <li><b>CO1:</b> Analyze the wave properties of light and the interaction of energy with the matter.</li> <li><b>CO2:</b> Apply electromagnetic wave propagation in different guided media.</li> <li><b>CO3:</b> Asses the electromagnetic wave propagation and its power in different media</li> <li><b>CO4:</b> Analyze the conductivity of semiconductors.</li> <li><b>CO5:</b> Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.</li> </ul>								
<b>List of Experiments</b>								
<ol style="list-style-type: none"> <li>Determination of the thickness of the wire using wedge shape method.</li> <li>Determination of the radius of curvature of the lens by Newton's ring method</li> <li>Determination of wavelength by plane diffraction grating method</li> <li>Dispersive power of a diffraction grating</li> <li>Study of the Magnetic field along the axis of a circular coil carrying current.</li> <li>Study the variation of B versus H of the magnetic material (B-H curve)</li> <li>Determination of the numerical aperture of a given optical fiber and angle of acceptance.</li> <li>Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.</li> <li>Determination of the energy gap of a semiconductor</li> <li>Determination of crystallite size using X-Ray diffraction spectra.</li> <li>Determination of Wavelength of LASER using diffraction grating.</li> <li>Determination of particle size using LASER.</li> <li>Determination of the resistivity of semiconductor by Four probe method.</li> <li>Determination of dielectric constant by charging and discharging method.</li> <li>Study the temperature dependence of resistance of a thermister.</li> </ol>								
<b>Textbooks:</b>								
<b>Reference Books:</b>								
<ol style="list-style-type: none"> <li>S. Balasubramanian, M.N.Srinivasan, "A Text book of Practical Physics"-S Chand Publishers, 2017.</li> <li><a href="http://vlab.amrita.edu/index.php-VirtualLabs">http://vlab.amrita.edu/index.php-VirtualLabs</a>, Amrita University.</li> </ol>								
<b>Online Learning Resources:</b>								

**Mapping of course outcomes with program outcomes**

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

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

Course Code	Data Structures Lab		L	T	P	C
20AES0504			0	0	3	1.5
Pre-requisite	Basic Mathematics	Semester	I - II			
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>To introduce to the different data structures</li> <li>To elucidate how the data structure selection influences the algorithm complexity</li> <li>To explain the different operations that can be performed on different data structures</li> <li>To introduce to the different search and sorting algorithms.</li> </ul>						
<b>Course Outcomes (CO):</b>						
<ul style="list-style-type: none"> <li><b>CO1:</b> Select the data structure appropriate for solving the problem</li> <li><b>CO2:</b> Implement searching and sorting algorithms</li> <li><b>CO3:</b> Derive new data types</li> <li><b>CO4:</b> Illustrate the working of linear and non linear data structure</li> <li><b>CO5:</b> Organize the data using Files structure</li> </ul>						
<b>Laboratory Experiments</b>						
<ol style="list-style-type: none"> <li>String operations using array of pointers</li> <li>Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.</li> <li>Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.</li> <li>Implementation of Singly Linked List, Doubly Linked List, Circular Linked List</li> <li>Stack implementation using arrays</li> <li>Stack implementation using linked lists</li> <li>Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.</li> <li>Queue implementation using linked lists</li> <li>Creation of binary search tree, performing operations insertion, deletion, and traversal.</li> <li>Breadth first search</li> <li>Depth first search</li> <li>Travelling sales man problem</li> <li>File operations</li> <li>Indexing of a file</li> <li>Reversing the links (not just displaying) of a linked list.</li> <li>Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using 'Ladies first' principle. You may create new linked lists if necessary.</li> <li>An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.</li> <li>A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table data type and support different operations on it.</li> </ol>						
<b>Textbooks:</b>						
<ol style="list-style-type: none"> <li>Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2<sup>nd</sup> Edition, Galgotia Book Source, Pvt. Ltd., 2004.</li> <li>Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.</li> </ol>						
<b>Reference Books:</b>						
<ol style="list-style-type: none"> <li>D. Samanta, "Classic Data Structures", 2<sup>nd</sup> Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.</li> <li>Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.</li> </ol>						
<b>Online Learning Resources:</b>						
<a href="https://www.youtube.com/watch?v=zWg7U00EAOE&amp;list=PLBF3763AF2E1C572F">https://www.youtube.com/watch?v=zWg7U00EAOE&amp;list=PLBF3763AF2E1C572F</a>						

#### Mapping of course outcomes with program outcomes

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

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

Course Code	Environmental Studies		L	T	P	C
20AMC9903			3	0	0	0
Pre-requisite	Basic Environmental Knowledge	Semester	I - II			
<b>Course Outcomes (CO):</b>						
<ul style="list-style-type: none"> <li>• <b>CO1:</b> To recognize and to understand the importance and scope of Environmental Studies.</li> <li>• <b>CO2:</b> To understand the importance of protecting natural resources, ecosystem for future generation by communication each other in the society create the awareness</li> <li>• <b>CO3:</b> Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.</li> <li>• <b>CO4:</b> By studying Environmental Science, students are exposed to the environment the enables one to find out solution of various environmental problems, encountered on and often.</li> <li>• <b>CO5:</b> At the end of the course, it is expected that student will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. These will enable every human being to live in a more sustainable manner.</li> </ul>						
<b>UNIT – I</b>			18 Hrs			
<p><b>Multidisciplinary Nature of Environmental Studies:</b> Introduction – Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.</p> <p><b>Natural Resources:</b> Renewable and non-renewable energy resources – Natural resources and associated problems.</p> <p><b>Forest resources:</b> Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.</p> <p><b>Water resources:</b> Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.</p> <p><b>Mineral resources:</b> Use and exploitation, environmental effects of extracting and using mineral resources, case studies.</p> <p><b>Food resources:</b> World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.</p> <p><b>Energy resources:</b> Renewable and non-renewable energy resources.</p>						
<b>UNIT – II</b>			20 Hrs			
<p><b>Ecosystems:</b> Concept of an ecosystem. – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).</p> <p><b>Biodiversity And Its Conservation :</b> Introduction- Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.</p>						
<b>UNIT – III</b>			10 Hrs			
<p><b>Environmental Pollution:</b> Definition, Causes, effects and its control measures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.</p> <p><b>Solid Waste Management:</b> Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.</p>						
<b>UNIT – IV</b>			15 Hrs			
<p><b>Social Issues and the Environment:</b> From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Public awareness.</p>						
<b>UNIT – V</b>			10 Hrs			
<p><b>Human Population and the Environment:</b> Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.</p>						
<b>Textbooks:</b>						
<ol style="list-style-type: none"> <li>1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.</li> <li>2. Environmental Studies by Kaushik, New Age Publishers.</li> </ol>						

3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

**Reference Books:**

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

**Online Learning Resources:**

www.nptel.ac.in

**Mapping of course outcomes with program outcomes**

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

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