BHARATHIDASAN UNIVERSITY  **TIRUCHIRAPPALLI - 620 024.**

BACHELOR COMPUTER APPLICATIONS

CHOICE BASED CREDIT SYSTEM –

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted from the academic year 2022-2023 onwards)

Sem.	Part	Course	Title	Ins. Hrs.	Credits	Exam Hours	Marks		Total
							Int.	Ext.	
I	I	Language Course – I Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course - I		6	3	3	25	75	100
	III	Core Course – I (CC)	Programming in C and Data Structures	5	5	3	25	75	100
		Core Practical – I (CP)	Programming in C Lab	4	4	3	40	60	100
		First Allied Course – I (AC)		4	4	3	25	75	100
		First Allied Course – II (AC)		3	-	-	-	-	-
	IV	Value Education		2	2	3	25	75	100
	TOTAL			**30**	**21**	**-**	**-**	**-**	**600**
II	I	Language Course - II Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course - II		6	3	3	25	75	100
	III	Core Course – II (CC)	Programming in Java	5	5	3	25	75	100
		Core Practical – II (CP)	Programming in Java Lab	4	4	3	40	60	100
		First Allied Course – II (AC)		3	2	3	25	75	100
		First Allied Course – III (AC)		4	4	3	25	75	100
		Add on Course – I ##	Professional English – I	6*	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Language Proficiency for Employability - Effective English	-	2	3	25	75	100
	TOTAL			**30**	**29**	**-**	**-**	**-**	**900**

III	I	Language Course – III Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course - III		6	3	3	25	75	100
	III	Core Course – III (CC)	Programming in Python	5	5	3	25	75	100
		Core Practical - III (CP)	Programming in Python Lab	4	4	3	40	60	100
		Second Allied Course – I (AC)		4	4	3	25	75	100
		Second Allied Course – II (AC)		3	-	-	-	-	-
		Add on Course – II ##	Professional English - II	6*	4	3	25	75	100
	IV	Non-Major Elective I @ - Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either **a)** Basic Tamil if Tamil language was not studied in school level **or** b) Special Tamil if Tamil language was studied upto 10^{th} & 12^{th} std.	Fundamentals of Information Technology	2	2	3	25	75	100
	TOTAL			**30**	**25**	-	-	-	**700**
IV	I	Language Course –IV Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course – IV		6	3	3	25	75	100
	III	Core Course - IV (CC)	Database Management Systems	5	5	3	25	75	100
		Core Practical - IV (CP)	Database Management Systems Lab	4	4	3	40	60	100
		Second Allied Course – II (AC)		3	2	3	25	75	100
		Second Allied Course – III (AC)		4	4	3	25	75	100
	IV	Non-Major Elective II @ - Thos who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either **a)** Basic Tamil if Tamil language was not studied in school level **or** b) Special Tamil if Tamil language was studied upto 10^{th} & 12^{th} std.	Working Principles of Internet	2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Digital Skills for Employability	-	2	3	25	75	100
	TOTAL			**30**	**25**	-	-	-	**800**

V	III	Core Course - V (CC)	Fundamentals of Algorithms	5	5	3	25	75	100
		Core Course – VI (CC)	Computer Networks	5	5	3	25	75	100
		Core Course – VII (CC)	Web Technology	5	5	3	25	75	100
		Core Practical -V (CP)	Web Technology Lab	4	4	3	40	60	100
		Major Based Elective – I (Any one)	1. Multimedia Technologies 2. Data Mining and Warehousing	5	4	3	25	75	100
	IV	Skill Based Elective I	Mobile Application Development	4	2	3	25	75	100
		Soft Skills Development		2	2	3	25	75	100
		TOTAL		**30**	**27**	**-**	**-**	**-**	**700**
VI	III	Core Course - VIII (CC)	Operating Systems	6	5	3	25	75	100
		Core Course - IX (CC)	Programming in PHP	6	5	3	25	75	100
		Core Practical – VI (CP)	Programming in PHP Lab	4	4	3	40	60	100
		Major Based Elective II (Any one)	1. Software Project Management 2. E-Commerce Technologies	5	4	3	25	75	100
		Project		4	3	-	20	80	100
	IV	Skill Based Elective – II	Internet of Things	4	2	3	25	75	100
	V	Gender Studies		1	1	3	25	75	100
		Extension Activities **		-	1	-	-	-	-
	VI	Naan Mudhalvan Scheme (NMS) @@		-	2	3	25	75	100
		TOTAL		**30**	**27**	**-**	**-**	**-**	**800**
GRAND TOTAL				**180**	**154**	**-**	**-**	**-**	**4500**

List of Allied Courses

First Allied Course	**Second Allied Course**
Mathematics	Accounting and Organizational Behaviour

$ For those who studied Tamil upto 10th +2 (Regular Stream).

+ Syllabus for other Languages should be on par with Tamil at degree level.

Those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part- I should study special Tamil in Part – IV.

The Professional English – Four Streams Course is offered in the 2nd and 3rd Semester (only for 2022-2023 Batch) in all UG Courses. It will be taught apart from the Existing hours of teaching / additional hours of teaching (1 hour /day) as a 4 credit paper as an add on course on par with Major Paper and completion of the paper is must to continue his / her studies further. (As per G.O. No. 76, Higher Education (K2) Department dated: 18.07.2020).

* The Extra 6 hrs / cycle as per the G.O. 76/2020 will be utilized for the Add on Professional English Course.

@ NCC Course is one of the Choices in Non-Major Elective Course. Only the NCC cadets are eligible to choose this course. However, NCC Course is not a Compulsory Course for the NCC Cadets.

** Extension Activities shall be outside instruction hours.

@@ Naan Mudhalvan Scheme.

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES

Sl. No.	Part	Types of the Courses	No. of Courses	No. of Credits	Marks
1.	I	Language Courses	4	12	400
2.	II	English Courses	4	12	400
3.	III	Core Courses	9	45	900
4.		Core Practical	6	24	600
5.		Allied Courses (1st & 2nd)	6	20	600
6.		Major Based Elective Courses	2	8	200
7.		Add –on Course (Professional English I & II)	2	8	200
8.		Project	1	3	100
9.	IV	Non-Major Elective Courses	2	4	200
10.		Skill Based Elective Courses	2	4	200
11.		Soft Skills Development	1	2	100
12.		Value Education	1	2	100
13.		Environmental Studies	1	2	100
14.	V	Gender Studies	1	1	100
15.		Extension Activities	1	1	---
16.	VI	Naan Mudhalvan Scheme	3	6	300
	Total		**46**	**154**	**4500**

PROGRAMME OUTCOMES:

- Graduates will be able to comprehend the basic concepts learnt and apply in real life situations with analytical skills.
- Graduates with acquired skills and enhanced knowledge will be employable / become entrepreneurs or will pursue higher Education.
- Graduates with acquired knowledge of modern software tools will be able to contribute effectively as software engineers.
- Graduates will be able to comprehend the related concepts to Computer Science with Allied papers
- Graduates will be imbibed with ethical values and social concerns to ensure peaceful society.

PROGRAMME SPECIFIC OUTCOMES:

After completing the Bachelor of Computer Applications Programme, the graduates would have

- Understand and analyze the fundamental knowledge in the domain of computer applications.
- Enhance the logical and analytical thinking to understand the computational systems.
- Ability to comprehend the structure, development methodologies of software systems and to design the software solutions.
- Explore the developing areas in the sphere of computer applications and to enrich themselves to be skilful to meet the diverse expectations of the industry.
- Equip them to be competent to provide optimal and ethical solutions to the technological challenges laid by the professional societies

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First Year **CORE COURSE I** **Semester I**

PROGRAMMING IN C AND DATA STRUCTURES

Code 22SCCCA1 **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To know about the basics of C Programming, Control and Looping Structures and programming with it.
- To understand Arrays, Pointers and String Processing in C language
- To know about the basic concepts in Data Structures

UNIT - I:

Basic of C: History of C and its importance – Structure of a C program – Data Types – Constants and Variables – Operators and Expressions – Order of Precedence, Evaluating of Arithmetic Expressions – Type Conversion- Decision Statements: if, if-else, and nested if statements.

UNIT - II:

Loops Structures: For Loop, While, Do-while loop – Arrays: - One Dimensional Array, Two-dimensional Arrays, Character Arrays and Strings – Functions: Function with arrays- Function with decision and looping statements - Recursion.

UNIT - III:

Pointers: Introduction – Pointer Expressions – Chain of Pointers –Pointers and Arrays – Array of Pointers – Pointers as function arguments – Functions returning Pointers – Pointers to Functions – Function pointer – Structures - declaration, initialization, Array of Structures – Pointer to structures, Structures and functions – Typedef, Enumerated data types, Unions.

UNIT - IV:

Strings Processing, Standard string library functions – Files: introduction and files functions – Writing and reading in Text mode – Simple application: Display the contents of a file. Write data to a file. Append data to an existing file – Simple application: Display the contents of a file. Write data to a file. Append data to an existing file – File IO – Reading and writing structures.

UNIT - V:

Stack: LIFO concept, Stack operations, Array implementation of stack – Queue: FIFO concept, Queue operations, Array implementation of queue – Singly Linked List: concepts, operations – Doubly Linked List: concepts, operations – Trees: General trees, Binary trees.

UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, New Delhi, Seventh Edition, 2016.
2. E. Horowitz, S. Sahni and Susan Anderson Freed, "Fundamental Data Structures in C", 2ed, Orient Black Swan Publisher, 2009.
3. Byron S. Gottfried, "Programming with C", Schaum's Outline Series, Tata-McGraw Hill Edition, New Delhi, 1991.
4. E. Karthikeyan, "A Textbook on C Fundamentals, Data Structures and Problem Solving", Prentice-Hall of India Private Limited, New Delhi, 2008.
5. Yashavant Kanetkar, "Let us C", BPB Publications, Tenth Edition, New Delhi, 2010.
6. Szuhay, Jeff, and Szuhay, Jeff, "Learn C Programming: A Beginner's Guide to Learning C Programming the Easy and Disciplined Way", Packt Publishing, 2020.
7. Jena, Sisir Kumar, and Jena, Sisir Kumar, "C Programming: Learn to Code", CRC Press, 2021.
8. https://www.tutorialspoint.com/cprogramming/index.htm
9. https://www.w3schools.in/data-structures/intro

COURSE OUTCOMES:

After completion of the course the students will be able to realize the following outcomes:

CO	COURSEC OUTOME	K LEVEL
CO1	To Summarize the basic knowledge to develop C programs	K2
CO2	To Manipulate Looping, arrays and functions	K4
CO3	To Apply and write programs for solving real world problems	K3, K2
CO4	To Create open, read, manipulate, write and close files.	K5
CO5	To Understand the basic concepts in data structures	K2

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	-	2	3	2	2	3	2
CO2	1	2	2	1	1	1	2	1	3	3
CO3	2	1	3	1	2	3	1	3	3	3
CO4	1	2	2	-	3	1	2	2	3	3
CO5	2	2	3	-	3	2	1	2	2	3

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First Year | **CORE PRACTICAL I PROGRAMMING IN C LAB** | **Semester I**

Code 22SCCCA1P | **(Practical)** | **Credit: 4**

COURSE OBJECTIVES:

- To understand the programming fundamentals of C language.
- To impart writing skill of C programming and data structures for a list of problems.
- To impart hands on training for writing a C program using computers

1. Write a Program
   (i) To convert temperature from degree Centigrade to Fahrenheit,
   (ii) Find whether given number is Even or Odd,
   (iii) Find the greatest of Three numbers.
2. Write a Program to display Monday to Sunday using switch statement
3. Write a Program to display first Ten Natural Numbers and their sum.
4. Write a Program to perform Multiplication of Two Matrices.
5. Write a Program
   (i) To find the maximum number in an Array using pointer.
   (ii) To reverse a number using pointer.
   (iii) To add two numbers using pointer.
6. Write a Program to solve Quadratic Equation using functions.
7. Write a Program to find factorial of a number using Recursion.
8. Write a Program to demonstrate Call by Value and Call by Reference.
9. Write a Program to create a file containing Student Details.
10. Write a program to Implement a stack using singly linked list, Implement Queue using Linked List.

COURSE OUTCOMES:

After completion of the course the students will be able to realize the following outcomes:

CO	COURSEC OUTOME	K LEVEL
CO1	To Relate the use of language constructs to solves simple programs	K3
CO2	To Develop programs for various concepts in C language	K6
CO3	To Understand and trace the execution of the list of programs	K2
CO4	To Understand the usage of file handling in C programming	K2
CO5	To Solve data problems related to data structures.	K3

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	2	2	3	2	2	3	2
CO2	2	2	2	2	3	3	3	3	3	3
CO3	1	1	3	1	3	3	1	1	3	3
CO4	2	3	1	2	2	3	2	2	3	3
CO5	3	2	1	2	2	3	2	2	2	3

ALLIEDCOURSE I

ALGEBRA AND CALCULUS

Code: 22SCACMM2A **(Theory)** **Credit:4**

COURSEOBJECTIVES:

- To train the students to solve the problems in theory of equations
- To provide knowledge about the matrix, differentiation and various methods for evaluation of integrals.

UNIT–I:

Theory of Equations: Relation between roots & coefficients –Transformations of Equations–Diminishing, Increasing &multiplying the roots by a constant-Forming equations with the given roots–Rolle‘s Theorem, Descarte‘s rule of Signs(statement only)– simple problems.

UNIT–II:

Matrices: Singular matrices–Inverse of a non-singular matrix using adjoint method-Rankofa Matrix – Consistency - Characteristic equation, Eigen values, Eigen vectors – Cayley Hamilton‘s Theorem (proof not needed) –Simple applications only

UNIT–III:

Differentiation: Maxima & Minima– Concavity, Convexity – Points of inflexion -Partial differentiation – Euler‘s Theorem - Total differential coefficients (proof not needed)– Simple problems only.

UNIT–IV:

Integration: Evaluation of integrals of types:

$$1)\int \frac{px+q}{ax^2+bx+c}\,dx \qquad 2)\int \frac{px+q}{\sqrt{ax^2+bx+c}}\,dx \qquad 3)\int \frac{dx}{a+b\cos x} \qquad 4)\int \frac{dx}{a+b\sin x}$$

Evaluation using Integration by parts–Properties of definite integrals– Fourier Series in the range $(0, 2\pi)$ – Odd & Even Functions – Fourier Half range Sine &Cosine Series

UNIT–V:

Differential Equations: Variables Separable–Linear equations–Second order of types($aD^2 + bD + c)y = F(x)$where a,b,c are constants and $F(x)$is one of the following types (i)e^{Kx}(ii)sin(kx) or cos(kx) (iii)x^n, n being an integer(iv)$e^{Kx}f(x)$

UNIT–VI CURRENT CONTOURS (For Continuous Internal Assessment Only): Derivatives of Implicit and parametric Functions

REFERENCES:

1. T.K.ManickavasagamPillai&others,Algebra,VolumeI,S.VPublications,1985RevisedEdition(UnitsI,II)
2. S.Narayanan, T.K. Manicavachagam Pillai, Calculus,Vol.II,S.ViswanathanPvtLimited,2003.(UnitsIII,IVandV)
3. M.L.Khanna,DifferentialCalculus,JaiprakashnathandCo.,Meerut-2004.

COURSE OUTCOMES :

After completion of the course the students will be able to realize the following outcomes:

CO	COURSE OUTOME	K LEVEL
CO1	Train the students to solve the problems in theory of equations.	**K1**
CO2	Apply Cayley Hamilton theorem for finding the inverse of square matrices.	**K3**
CO3	Get exposed the basic concepts of differentiation and integration.	**K2**
CO4	Acquire the knowledge about differential equations.	**K5**
CO5	Learn the concepts of second – order differential equations with constant coefficients and train the students to solve it	**K4,K5**

Mapping with Programme and Programme specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**3**	**3**	**1**	**2**	2	1	2	3	2
CO2	**1**	**2**	**2**	**1**	**1**	3	2	3	1	2
CO3	**2**	**1**	**3**	**1**	**2**	1	3	2	3	2
CO4	**1**	**2**	**2**	**2**	**3**	3	2	1	2	3
CO5	**2**	**2**	**3**	**1**	**3**	3	1	2	3	3

First Year **CORE COURSE II** **Semester II**

PROGRAMMING IN JAVA

(Theory) **Credit: 5**

COURSE OBJECTIVES:

- To acquire the programming skills with java.
- To implement the object-oriented concepts with java language
- To learn the art of GUI programming with Applet.

UNIT - I:

Foundation, Essentials, Control Statement and Classes & Objects. Stage of Java – origin of Java – challenges - features - Object-Oriented Programming; Java Essentials: Elements - API - variables - primitive data types – String Class - operators –combined assignment operators - conversion –scope – comments - keyboard input; Control Statements: if, if-else, nested if & if-else-if statements – logical operators – comparison – conditional operator – switch – increment and decrement – while, do-while &f or loops – nested loops – break and continue; Classes and Objects: classes and objects -modifiers - passing arguments– constructors - package & import - static class members –method overloading– constructor overloading –returning objects – this variable – recursion – nested & inner classes – abstract classes & methods.

UNIT - II:

Arrays, String Handling, Inheritance, Interface and Packages. Introduction –processing array – passing arrays – returning arrays – String arrays – two Dimensional Arrays - Arrays with Three or More Dimensions; String Handling : String class – concatenation – comparison – substring – methods – other methods–String Buffer, String Builder &String Tokenizer classes; Inheritance: basics –inheriting and overriding superclass methods – calling superclass constructor – polymorphism – inherit from different classes – abstract classes – final Class; Interfaces: Basics – multiple Interfaces – multiple inheritance using interface – multilevel interface – Packages – Create and access packages in NetBeans IDE – static Import and package class – access specifiers.

UNIT - III:

Exception Handling, I/O and File Handling and Multithreading. Introduction - try and catch block - multiple catch block - nested try - finally Block – throw Statement – exception propagation – throw Clause - custom exception – built-in exception; Multithreading: Introduction – threads – thread creation – life cycle – joining a thread – scheduler &priority – synchronization – inter-thread communication – thread control – thread Pool – thread group – daemon thread; Files and I\O Streams: file Class – streams – byte streams – filtered byte streams – Random Access File class – character streams.

UNIT - IV:

Applet and GUI Part I. Fundamentals – applet class – life cycle – steps for applet program – passing values through parameters – graphics – event handling; GUI I: GUI – creating windows – dialog boxes – layout managers – AWT component classes – Swing component classes – applications of AWT controls.

UNIT - V:

GUI Part II and Java Database Connectivity Event handling – AWT components – AWT graphics classes – Swing controls – application using Swing and AWT; Java Database

Connectivity: types of drivers – JDBC architecture – JDBC classes &interfaces – steps in JDBC applications – creating a new Database and table with JDBC.

REFERENCES:

1. S. Sagayaraj, R. Denis, P. Karthik & D. Gajalakshmi, "Constructive Java Programming", Universities Press, 2021.
2. E. Balagurusamy, "Programming with JAVA", Tata McGraw Hill, New Delhi, 2019.
3. C. Muthu, "Programming with JAVA", Vijay Nicole Imprints Private Limited, Chennai, Second Edition, 2011.
4. Bruce Eckel, Chuck Allison, "Thinking in Java", Prentice Hall Publications, 2006
5. Malina Pronto, "Java: How To Learn Java Programming: How To Improve Your Java Coding In 2020/2021: 5 Programming Languages To Learn For Beginners In Tech", Independently Published, 2020.
6. Nick Samoylov, "Learn Java 12 Programming: A Step-by-step Guide to Learning Essential Concepts in Java", Packt Publishing, 2019.
7. https://www.javatpoint.com/java-tutorial

COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

)	**COURSE OUTOME**	**K LEVEL**
)1	Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.	
)2	Identify members of a class and to implement them.	
)3	Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifies, and create user define package for specific task (reusability concepts) error exception handling).	
)4	Develop programs using the Java standard class library.	
)5	velop software using Java programming language (using applet, AWT controls, and JDBC).	

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	2	2	3	2	2	2	3	3	1	2
CO2	1	2	2	1	2	2	2	2	1	3
CO3	2	2	3	1	2	3	2	2	1	2

CO4	1	2	2	1	3	3	2	3	2	3
CO5	2	2	3	2	3	2	3	3	2	2

PROGRAMMING IN JAVA LAB
(Practical) **Credit: 4**

COURSE OBJECTIVES

- To understand the basics of JAVA programs and their execution.
- To learn concepts like inheritance, packages and interfaces.
- To understand the life cycle of the applets, database connectivity and their functionality.

1. Write a program to sort the given numbers using arrays.
2. Write a program to implement the FIND and REPLACE operations in the given text.
3. Write a program to implement a calculator to perform basic arithmetic Operations, doing with constructers.
4. Write a program to find the student's percentage and grade using command line arguments.
5. Write a program to draw circle or triangle or square using polymorphism and inheritance.
6. Implement multiple inheritance concepts in java using interface, you can choose your own example of a company or education institution or a general concept which requires the use of interface to solve a particular problem.
7. Write a program to create threads and perform operations like start, stop, suspend, resume.
8. Write a program to develop an applet to play multiple audio clips using multithreading.
9. Write a program to retrieve employee data from a file.
10. Write a program to retrieve student data from a Database.**COURSE OUTCOMES (CO)**

After completion of the course the students will be able to realize the following outcomes:

O	COURSE OUTOME	K LEVEL
O1	Develop java programs to understand the OOP concepts.	
O2	Write java programs for classes and objects	
O3	Develop simple programs with multiple threads	
O4	Write java programs using Applets	
O5	Develop java programs to connect databases and files.	

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	3	3	2	3	1	3	2
CO2	2	2	1	3	3	2	2	2	1	3
CO3	2	2	2	2	2	3	2	2	3	1
CO4	2	2	2	3	3	2	3	3	2	3
CO5	2	2	3	2	2	3	1	3	2	2

ALLIED COURSE II
NUMERICAL ANALYSIS
AND
PROBABILITY

Code: **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- To learn knowledge about an algebraic and transcendental equations.
- To make the students gain wide knowledge in probability which plays a mainrole in solving real life problems.

UNIT – I:

Algebraic & Transcendental equations: Bisection Method, Newton Raphson Method, Iteration method - Finite differences – Forward, Backward differences – Newton‘s forward & backward difference interpolation formulae – Lagrange‘s interpolating polynomial.

UNIT – II:

Numerical differentiation - Numerical Integration using Trapezoidal rule and Simpson‘s first & second rules (proof not needed) - Solutions to Linear Systems – Gaussian Elimination Method – Jacobi & Gauss Siedal iterative methods – Theory and problems.

UNIT – III:

Numerical solution of ODE: Solution by Taylor Series Method, Euler‘s Method, Runge - Kutta 2nd order method- Adam‘s Predictor Corrector Method and Milne‘s Predictor Corrector Methods.

UNIT – IV:

Arithmetic Mean – Geometric Mean – Harmonic Mean - Median, Mode, Standard Deviation - Quartile Deviation – Percentiles - Expectation – Variance and covariance.

UNIT – V:

Correlation and Regression –Properties of Simple Correlation and regression coefficients – Simple Numerical Problems only.

REFERENCES:

1. S.S. Sastry, Numerical Analysis (Unit 1, 2, 3)
2. Gupta. S.C & Kapoor, V.K, Fundamentals of Mathematical Statistics, Sultan Chand & sons, New Delhi -1994. (Units 4 & 5)
3. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Private Limited, 1999.
4. C.E. Froberg, Introduction to Numerical Analysis, II Edn., Addison Wesley,1979.

COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

O	COURSE OUTOMES	K LEVEL
O1	Solve algebraic and transcendental equations.	
O2	Apply the various methods of Numerical differentiation and Integration.	
O3	Get exposed the basic concepts of mean, median and mode.	
O4	Understand the students to solve the problems of Correlation and Regression.	
O5	Appreciate the importance of probability of random variables and understandthe correlation and regression coefficients.	

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	1	2	3	3	3	2
CO2	3	2	3	1	2	2	2	2	3	3
CO3	1	3	1	2	2	3	2	2	3	2
CO4	2	2	1	3	3	3	3	3	2	3
CO5	2	1	2	3	2	3	3	3	2	2

ALLIED COURSE III
OPERATIONS RESEARCH

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To learn the basic concepts about Linear Programming Problem, Transportation Problem Assignment Problem, Sequencing Problem and Network.
- To make students solve real life problems in Business and Management.

UNIT – I:

Operations Research: Introduction - Basics of OR – OR & decision making – Role of Computers in OR - Linear programming formulations & graphical solution of two variables – Canonical & standard forms of LPP

UNIT – II:

Simplex Method: Simplex Method for <, =, > constraints – Charne‘s method of penalties– Two phase Simplex method.

UNIT – III:

Transportation problem: Transportation algorithm –Degeneracy algorithm – Degeneracy in Transportation Problem, Unbalanced transportation problem- Assignment algorithm – Unbalanced Assignment problem

UNIT – IV:

Sequencing problem: Processing of n jobs through two machines – Processing of n jobs through 3 machines – processing of two jobs through m machines.

UNIT – V:

Networks: Network – Fulkerson‘s rule - measure of activity – PERT computation – CPM computation - Resource scheduling.

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4. Hamdy A. Taha, Operations Research (7th Edn.), McMillan Publishing

Company, New Delhi, 1982.

COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

CO	COURSEC OUTOME	K LEVEL
01	Acquire the basic concepts of LPP.	
02	Apply various methods for finding a solution of an LPP.	
03	Categorize the various simplex methods.	
04	Evaluate transportation and degeneracy algorithms.	
05	Use the basic concepts of TP, AP and Network Problems to develop the problem solving skills.	

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	1	2	3	1	1	2
CO2	2	1	2	3	2	1	2	1	3	3
CO3	2	3	2	1	2	3	2	2	3	2
CO4	1	2	2	3	2	1	3	1	2	3
CO5	2	2	1	2	2	2	3	3	1	1

ENVIRONMENTAL STUDIES

Unit: 1

The Multidisciplinary nature of environmental studies
Definition, scope and importance. (2 lectures)
Need for public awareness

Unit: 2

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

a) Forest resources: use and over-exploitation, deforestation, case studies. Timberextraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods,drought, conflicts over water, dams benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting andusing mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energysources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resources, land degradation, man induced Landslides,soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

(8 lectures)

Unit: 3 **Ecosystems**

- Concept of an ecosystem.
- Structure and function 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 thefollowing ecosystem:-
- a. Forest ecosystem
- b. Grassland ecosystem

- c. Desert ecosystem
- d. Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit: 4 **Biodiversity and its conservation**

- Introduction – Definition : Genetic, species and ecosystem diversity
- Biogeographical classification of India
- 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-wildlifeconflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation ofbiodiversity.
- Biological Diversity Act 2002/ BD Rules, 2004

(8 lectures)

Unit: 5 **Environmental Pollution**

Definition

Causes, effects and control measures of:

a. Air Pollution
b. Water Pollution
c. Soil Pollution
d. Marine Pollution
e. Noise pollution
f. Thermal Pollution
g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urbanand industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides.
- Ill-Effects of Fireworks: Firework and Celebrations, Health Hazards, Types of Fire, Firework and Safety

(8 lectures)

Unit: 6 **Social Issues and the Environment**

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns.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.
- Issues involved in enforcement of environmental legislation
- Public awareness.

(7 lectures)

Unit: 7 **Human Population and the Environment**

- Population growth, variation among nations.
- Population explosion – Family Welfare Programmes
- 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.

Unit: 8 **Field Work**

- Visit to a local area to document environmental assets-river / forest/grassland/ hill / mountain

References:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd Bikaner.
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11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws Himalaya Pub.House, Delhi 284 p.
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16. Rao MN & Datta, A.K. 1987 Waste Water treatment, Oxford & IBH Publication Co. PvtLtd 345 p.
17. Sharma B.K. 2001 Environmental chemistry Goel Publ House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C. Harper, J and Michael Begon, Essentials of Ecology, Blackwell science(TB)
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22. Wagner K.D. 1998 Environmental Management. W.B. Saunders Co. Philadelphia

    USA499 p (M) Magazine (R) Reference (TB) Textbook

    http://nbaindia.org/uploaded/Biodiversityindia/Legal/BiologicalDiversityRules,2004.pdf.

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COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

CO	COURSE OUTOME	K LEVEL
)1	Understand the fundamentals of Environmental sciences.	
)2	Gains knowledge on the basic concepts of eco systems and its components.	
)3	understand the concepts of food chain, food web and energy flow in an eco-system.	
)4	Obtain the knowledge of sustainable environment.	
)5	Gain knowledge in all types of pollution.	

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	3	2	2	3	1	3	2
CO2	3	2	1	2	2	1	2	2	3	1
CO3	2	1	3	2	3	3	2	1	3	1
CO4	1	3	2	2	1	2	3	3	2	3
CO5	2	2	1	2	2	3	2	1	2	2

Professional English for Physical Science -I [Part-III - AddonCourse]

UNIT 1: COMMUNICATION

1. **Listening**: Listening to instructions

2. **Speaking**: Telephone etiquette and Official phone conversations

3. **Reading** short passages (3 passages, one from each – Physics, Chemistry,Mathematics/Computer Science)

5. **Writing:** Letters and Emails in professional context

6. **Grammar in Context:**

- Wh and yes or no,
- Q tags
- Imperatives

7. **Vocabulary in Context:** Word formation -

i) Creating antonyms using Prefixes

ii) Intensifying prefixes (E. g inflammable)

Changing words using suffixes

A) Noun Endings

B) Adjective Endings

C) Verb Endings

UNIT 2: DESCRIPTION

Listening – Listening to process description

Speaking - Role play

Formal: With faculty and mentors in academic environment, workplacecommunication

Informal: With peers in academic environment, workplacecommunication

Reading –Reading passages on products, equipment and gadgets

Writing – Writing sentence definitions (e.g. computer) and extended definitions(e.g. artificial intelligence)

Picture Description – Description of Natural Phenomena

Grammar **in Context**: Connectives and linkers.

Vocabulary – Synonyms (register) - Compare & contrast expressions.

UNIT 3: NEGOTIATION STRATEGIES

Listening - Listening to interviews of specialists / inventors in fields (Subjectspecific)

Speaking – Brainstorming. (mind mapping). Small group discussions (subject-specific)

Reading – longer Reading text. (Comprehensive passages)

Writing – Essay Writing (250-word essay on topics related to subject area, like pollution, use of pesticides in cultivation, merits and demerits of devices like mobile phones, merits and demerits of technology in development)

Grammar in Context: Active voice & Passive voice – If conditional -Collocations –Phrasal verbs

UNIT 4: PRESENTATION SKILLS

Listening - Listening to presentation. Listening to lectures. Watching –documentaries (discovery / history channel)

Speaking –Short speech

- Making formal presentations (PPT)

Reading – Reading a written speech by eminent personalities in the relevant field /Short poems / Short biography.
Writing - Writing Recommendations
Interpreting visuals - charts / tables/flow diagrams/charts
Grammar in Context – Modals
Vocabulary (register) - Single word substitution

UNIT 5: CRITICAL THINKING SKILLS

Listening - Listening to advertisements/news and brief documentary films (withsubtitles)

Speaking – Simple problems and suggesting solutions.

Reading: Motivational stories on Professional Competence, Professional Ethicsand Life Skills (subject-specific)

Writing Studying problem and finding solutions- (Essay in 200 words)

Grammar-Make simple sentences
Vocabulary -Fixed expressions

COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

CO	COURSEC OUTOME	K LEVEL
)1	elop the language skills of students by offering adequate practice inprofessional contexts.	
)2	Enhance the lexical, grammatical and socio-linguistic andcommunicative competence of first year physical sciences students.	
)3	Focus on developing students' knowledge of domain specific registers and the required language skills.	
)4	Develop strategic competence that will help in efficient communication.	
)5	Sharpen students critical thinking skills and make students culturallyaware of the target situation.	

Mapping with Programme and Programme specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	2	2	2	3	3	1	3
CO2	2	2	2	1	1	2	2	2	1	3
CO3	2	1	3	1	2	3	2	2	1	2
CO4	1	2	2	2	3	2	2	3	2	3
CO5	2	2	2	2	3	2	3	2	2	3

Second Year **CORE COURSE III** **S**

PROGRAMMING IN PYTHON

(Theory)

COURSE OBJECTIVES:

- To develop programs using functions and pass arguments in Python.
- To write programs using loops and decision statements in Python.
- To design and program Python applications.

UNIT - I:

Introduction to Python: Features of Python - How to Run Python - Identifiers - Reserved Keywords - Variables - Comments in Python - Indentation in Python - Multi-Line Statements - Multiple Statement Group (Suite) - Quotes in Python - Input, Output and Import Functions - Operators. Data Types and Operations: Numbers – Strings – List – Tuple – Set – Dictionary – Data type conversion.

UNIT - II:

Flow Control: Decision Making – Loops – Nested Loops – Types of Loops. Functions: Function Definition – Function Calling - Function Arguments - Recursive Functions - Function with more than one return value.

Unit - III:

Modules and Packages: Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - The dir() function - The reload() function - Packages in Python - Date and Time Modules. File Handling- Directories in Python.

UNIT - IV:

Object-Oriented Programming: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes- Destructors in Python – Encapsulation - Data Hiding – Inheritance - Method Overriding- Polymorphism.

UNIT - V:

Exception Handling: Built-in Exceptions-Handling Exceptions- Exception with Arguments - Raising Exception - User-defined Exception - Assertions in Python. Regular Expressions: The match() function - The search() function - Search and Replace - Regular Expression Modifiers: Option Flags-Regular Expression Patterns- Character Classes-Special Character

Classes - Repetition Cases - findall() method - compile() method.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

An Introduction to Interactive Programming in Python - Study on Julia – a high level language approach.

REFERENCES:

1. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Book Publishing Co, 2016.
2. Mark Summerfield. —Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
3. Martin C. Brown, —PYTHON: The Complete Reference‖, McGraw-Hill, 2001
4. Wesley J. Chun, "Core Python Programming", Prentice Hall Publication, 2006.
5. Timothy A Budd, "Exploring Python", Tata McGraw Hill, New Delhi, 2011
6. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2016.
7. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O Reilly Publishers, 2016
8. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

CO	COURSE OUTOME	K LEVEL
CO1	To recall and understand the features of python programming language.	K2
CO2	To illustrate various programming mechanism used in python.	K3
CO3	To apply various language construct to write simple programs in python.	K5
CO4	To examine the application of object- oriented concept in python.	K4
CO5	To distinguish the various constructs used in python.	K3

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	-	2	2	3	3	3	2

CO2	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**3**	**3**
CO3	**2**	**2**	**3**	**1**	**2**	**3**	**2**	**2**	**3**	**2**
CO4	**1**	**2**	**2**	**-**	**3**	**3**	**3**	**3**	**2**	**3**
CO5	**2**	**2**	**3**	**-**	**3**	**3**	**3**	**3**	**2**	**2**

Second Year **CORE PRACTICAL III** **Semester III**

PROGRAMMING IN PYTHON LAB

(Practical) **Credit: 4**

COURSE OBJECTIVES:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- To represent compound data using Python lists, tuples, and dictionaries.

1. Flow controls, Functions and String Manipulation
2. Operations on Tuples and Lists
3. Operation on sets
4. Operations on Dictionary
5. Simple OOP– Constructors – create a class for representing a car
6. Method Overloading – create classes for vehicle and Bus and demonstrate method overloading
7. Files – Reading and Writing – perform the basic operation of reading and writing with student file
8. Regular Expressions
9. Modules
10. Packages
11. Exception Handl

COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

CO	COURSE OUTOME	K LEVEL
CO1	Write simple programs using control structures, functions and strings.	K2
CO2	Develop programs using tuples, lists, sets and dictionary.	K4
CO3	Write simple programs using Constructors, Method overloading and inheritance.	K5
CO4	Develop programs using files and regular expressions	K4
CO5	Write simple programs using packages and exception handling.	K3

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**2**	**1**	**2**	**2**	2	3	3	3	2
CO2	**2**	**1**	**2**	**3**	**2**	2	2	2	3	3
CO3	**2**	**2**	**2**	**1**	**1**	3	2	2	3	2
CO4	**3**	**3**	**1**	**3**	**3**	3	3	3	2	3
CO5	**3**	**2**	**1**	**3**	**1**	3	3	3	2	2

ALLIED COURSE-I PRINCIPLES OF ACCOUNTING

Code: **(Theory)** **Credit:4**

LEARNING OBJECTIVES:

- To enable the students to understand the basic principles and concepts of Accountancy.
- To gain the knowledge to prepare the Cash Book and Bank Reconciliationstatement.
- To enhance the students to prepare the Final accounts for Sole Traders
- To help students gain knowledge about Rectification of errors.
- In overall students can acquire conceptual knowledge and prepare the Bills of Exchange.

UNIT- I:

Accounting concepts - Conventions - Rules of Double entry book keeping.Journal - Ledger – Trial Balance.

UNIT -II:

Cash Book – Three Column Cash Book Bank Reconciliation statement.

UNIT -III:

Final Accounts of Sole Traders: Trading and Profit and Loss Account, BalanceSheet.

UNIT -IV:

Errors disclosed by Trial Balance and Not disclosed by Trial Balance -Rectification of errors, Suspense Account.

UNIT -V:

Bills of Exchange - Renewal of Bill - Retiring of Bills - Notary charges.

TEXT AND REFERENCE BOOKS (Latest revised edition only)

1. R.L. Gupta and Radhaswamy- Financial Accounting - S.ChandPublishers-Delhi.
2. S.P. Jain and K.L. Narang**, "Advanced Accounting**," Kalyani Publishers,New Delhi
3. RSN. Pillai, Bagavathi S. Uma, "Advanced **Accounting**," S. Chand &Co, New Delhi.
4. M.C. Shukla, **"Advanced Accounts**," S. Chand and Co., New Delhi.
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10. Tulsian., P.C.(2016) Financial Accounting, Tata Mcgraw-Hill, New Delhi.

COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

CO	COURSE OUTOME	K LEVEL
CO1	Understand the concepts and conventions of financial accounting.	K2
CO2	Preparation of accounts of cash book.	K3
CO3	Evaluate the accounting for sole traders with adjustment ntries.	K5
CO4	Identify and rectification of Errors.	K4
CO5	Develop and preparation of Bills of Exchange.	K3

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	1	2	2	1	3	3	2
CO2	2	3	2	2	3	2	2	2	3	3
CO3	2	1	1	3	2	3	2	2	3	2
CO4	3	3	3	2	3	3	3	1	2	3
CO5	1	2	2	1	2	3	3	2	2	2

Professional English for Physical Science-II [Part-III-Addon Course]

Unit 1- Communicative Competence

Listening – Listening to two talks/lectures by specialists on selected subject specific topics -(TED Talks) and answering comprehension exercises (inferential questions)

Speaking: Small group discussions (the discussions could be based on the listening and reading passages- open ended questions

Reading: Two subject-based reading texts followed by comprehension activities/exercises

Writing: Summary writing based on the reading passages.

Grammar and vocabulary exercises/tasks to be designed based on the discourse patterns of thelisteningandreadingtextsinthebook.Thisis applicable for all the units.

Unit 2 - Persuasive Communication

Listening: listening to a product launch- sensitizing learners to the nuances of persuasive communication

Speaking: debates – Just-A Minute Activities
Reading: reading texts on advertisements (on products relevant to the subject areas) and answering inferential questions

Writing: dialogue writing- writing an argumentative /persuasive essay.

Unit 3- Digital Competence

Listening to interviews (subject related)

Speaking: Interviews with subject specialists (using video conferencing skills)

Creating Vlogs (How to become a vlogger and use vlogging to nurture interests – subject related)

Reading: Selected sample of Web Page (subject area)

Writing: Creating Web Pages

Reading Comprehension: Essay on Digital Competence for Academic and Professional Life.

The essay will address all aspects of digital competence in relation to MS Office and how they can be utilized in relation to work in the subject area

Unit 4 - Creativity and Imagination)

Listening to short (2 to 5 minutes) academic videos (prepared by EMRC/ other MOOC videos

on Indian academic sites – E.g. https://www.youtube.com/watch?v=tpvicScuDy0)

Speaking: Making oral presentations through short films – subject based

Reading: Essay on Creativity and Imagination (subject based)

Writing – Basic Script Writing for short films (subject based)

- Creating blogs, flyers and brochures (subject based)
- Poster making – writing slogans/captions (subject based)

Unit 5- Workplace Communication & Basics of Academic Writing

Speaking: Short academic presentation using PowerPoint

Reading & Writing: Product Profiles, Circulars, Minutes of Meeting. Writing an introduction, paraphrasing

Punctuation (period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis Capitalization (use of upper case)

COURSE OUTCOMES (CO)

After completion of the course the students will be able to realize the following outcomes:

CO	COURSE OUTOME	K LEVEL
CO1	Develop their competence in the use of English with particular reference to the workplace situation.	**K2**
CO2	Enhance the creativity of the students, which will enable them to think of innovative ways to solve issues in the workplace.	**K3**
CO3	Develop their competence and competitiveness and there by improve their employability skills.	**K5**
CO4	Help students with a research bent of mind develop their skills in writing reports and research proposals.	**K4**
CO5	Demonstrate basic understanding of present conclusions effectively, orally, and in writing.	**K3**

Mapping with Programme Outcomes and Programme Specific Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	2	2	3	2	1	3	3	2
CO2	2	2	2	2	3	2	2	2	3	1
CO3	1	1	3	1	3	1	2	2	1	2
CO4	2	3	1	2	2	3	3	1	2	1
CO5	3	2	1	2	2	2	1	3	1	2