Curriculum of Diploma Programme

in

Computer Engineering

Department of Science, Technology and Technical Education (DSTTE), Govt. of Bihar

State Board of Technical Education (SBTE), Bihar

Semester – II
Teaching & Learning Scheme

Course Codes	Category of course	Course Titles	Teaching & Learning Scheme (Hours/Week)					
			Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
			L	T				
2418101	**BCC**	**Programming with C** (CSE, AIML)	03	-	04	02	09	06
2418102	**BCC**	**Web Technology** (CSE, AIML)	03	-	04	02	09	06
2400103B	**ASC**	**Applied Chemistry -B** (CSE, AIML, EE, ELX, ELX (R))	03	-	04	02	09	06
2400104	**HSC**	**Communication Skills (English)** (Common for all Programmes)	03	-	04	02	09	06
2400105B	**ASC**	**Applied Mathematics -B** (CSE, AIML)	02	01	-	02	05	04
2400107	**NRC**	**Professional Ethics** (CE, CSE, ELX, ELX (R), FTS, ME, AIML, MIE, CHE, CRE, FPP, GT, EE, AE, CACDDM)	01	-	-	-	01	01
2400108	**NRC**	**Essence of Indian Knowledge System and Tradition** (Common for All Programmes)	01	-	-	-	01	01
Total			**16**	**1**	**16**	**10**	**43**	**30**

Note: Prefix will be added to Course Code if applicable (T for Theory, P for Practical Paper and S for Term Work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

Semester - II
Assessment Scheme

Course Codes	Category of course	Course Titles	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
			Theory Assessment (TA)		Term work & Self-Learning Assessment (TWA)		Lab Assessment(LA)		
			Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2418101	**BCC**	**Programming with C** (CSE, AIML)	30	70	20	30	20	30	200
2418102	**BCC**	**Web Technology** (CSE, AIML)	30	70	20	30	20	30	200
2400103B	**ASC**	**Applied Chemistry -B** (CSE, AIML, EE, ELX, ELX (R))	30	70	20	30	20	30	200
2400104	**HSC**	**Communication Skills (English)** (Common for all Programmes)	30	70	20	30	20	30	200
2400105B	**ASC**	**Applied Mathematics -B** (CSE, AIML)	30	70	20	30	-	-	150
2400108	**NRC**	**Essence of Indian Knowledge System and Tradition** (Common for All Programmes)	25	-	-	-	-	-	25
2400107	**NRC**	**Professional Ethics** (CE, CSE, ELX, ELX (R), FTS, ME, AIML, MIE, CHE, CRE, FPP, GT, EE, AE, CACDDM)	25	-	-	-	-	-	25
Total			**200**	**350**	**100**	**150**	**80**	**120**	**1000**

Note: Prefix will be added to Course Code if applicable (T for Theory, P for Practical Paper and S for Term Work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

A) Course Code : 2418101(T2418101/P2418101/S2418101)
B) Course Title : Programming with C (CSE, AIML)
C) Pre- requisite Course(s) :
D) Rationale :

In order to write programs to cater with various IT solutions, software developer needs to build logic, develop algorithms and flow charts and then apply coding in a suitable programming language.
This course is designed keeping in view developing these skills in students with the 'C' programing language. The 'C' has been widely used as a general-purpose language to develop basic and advanced applications. The course is basically designed to create a base to develop foundation skills of programming language.
This course deals with fundamental syntactics of 'C' that will help the students to apply the basic concepts, program structure and principles of 'C' programming paradigm to build given application.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Develop flowchart and algorithm to solve problems logically.
CO-2 Write simple 'C' programs using arithmetic expressions.
CO-3 Develop 'C' programs using control structure.
CO-4 Develop 'C' programs using arrays and structures.
CO-5 Develop/Use functions in C programs for modular programming approach.
CO-6 Develop 'C' programs using pointers.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	1	2	1	-	-	-	-		
CO-2	1	1	1	1	-	-	-		
CO-3	1	2	1	1	-	-	-		
CO-4	1	2	1	1	-	-	-		
CO-5	1	2	2	1	-	-	-		
CO-6	1	2	3	1	-	-	-		

Legend: High (3), Medium (2), Low (1) and No mapping (-)
***** PSOs will be developed by the respective program coordinator at the institute level. As per the latest NBA guidelines, formulating PSOs is optional

G) Teaching and Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2418101	Programming with 'C'	03	-	04	02	09	06

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2418101	Programming with 'C'	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2418101

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Write Pseudo program logic for the given problem. TSO 1b. Identify the given symbols of a flow chart. TSO 1c. Explain guidelines for preparing flowchart with example. TSO 1d. Create flowchart to logically solve the given problem.	**Unit-1.0 Program Logic Development** **1.1 Fundamentals of Algorithms:** Notion of an algorithm. Pseudo-code conventions like assignment statements and basic control structures. **1.2 Algorithmic Problems:** Develop fundamental algorithms to solve simple problems such as: (i) solve simple arithmetic expression (ii) find the greatest of three numbers (iii) determine whether a given number is even or odd (iv) determine whether a given number is prime. **1.3 Flowchart:** Flowchart, Symbols of flowchart, Guidelines for preparing Flowchart	**CO1**
TSO 2a. Identify the given building block of a C program. TSO 2b. Write simple 'C' program using the given arithmetic expressions TSO 2c. Write a simple 'C' Program demonstrating the given data type conversion TSO 2d. Write I/O Statements for the given data.	**Unit-2.0 Basics of C Programming** **2.1 Introduction to C**: History of 'C' General Structure of a 'C' program: Header files, 'main' function. **2.2 Data Concepts:** Character set, tokens, keywords, Identifiers, Variables, Constant, data types, C operators, Arithmetic operators, Arithmetic expression, declaring variables, and data type conversion. **2.3 Basic Input Output:** Input and Output statements, using printf() and scanf(), character input/output statements, Input/output formatting, Use of comments	**CO2**
TSO 3a. Write a 'C' program using decision making structure for two-way branching to solve the given problem. TSO 3b. Write a 'C' program using decision making structure for multi-way branching to solve the given problem. TSO 3c. Write a 'C' program using loop statements to solve the given iterative problem. TSO 3d. Use appropriate statements to change the program flow in the given loop.	**Unit-3.0 Decision Making and Branching** **3.1 Decision Making and Branching**: Relational and logical operators, if statement, if else statement, nested if-else, if-else ladder', The switch statement **3.2 Looping:** while loop, do… while loop for loop, go to statement, Use of break and continue statements	**CO3**
TSO 4a. Write statements to read, write the given array. TSO 4b. Manipulate the given array of characters and numbers. TSO 4c. Use the structure for solving the given problem. TSO 4d. Write a sample program to demonstrate use of the given enumerated data type.	**Unit-4.0 Array and Structure** **4.1** Characteristics of an array, One dimension and two-dimension arrays, Array declaration and Initialization **4.2** Array of characters, Operation on array Character and String input/output **4.3** Introduction and Features of Structures, Declaration and Initialization of Structures Typedef, Enumerated Data Type, using structures in C Program	**CO4**
TSO 5a. Use the given Library function. TSO 5b. Develop user defined functions for the given problem. TSO 5c. Write 'C' codes to pass the given function parameters using "call by value" and "call by	**Unit-5.0 Concept and Need of Functions** **5.1** Library functions: Math functions, String handling functions, other miscellaneous functions.	**CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
reference" approach. TSO 5d. Write recursive function for the given problem.	**5.2** Writing User defined functions, scope of variables, Parameter passing: call by value, call by reference. **5.3** Recursive functions	
TSO 6a. Use pointers to access memory locations using pointer to solve the given problem. TSO 6b. Use pointers for performing the given arithmetic operation. TSO 6c. Develop a program to access elements of the given array using pointers. TSO 6d. Develop a program to access elements of the given structure using pointers.	**Unit-6.0 Pointers** **6.1** Concepts of pointers: declaring, initializing, accessing, Pointer arithmetic. **6.2** Handling arrays using pointers, Handling functions using pointers, Handling structures using pointers	**CO6**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2418101

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Write, execute and debug simple 'C' program LSO 1.2. Write and execute simple 'C' program using variables, arithmetic expressions	1.	(a) Develop minimum 3 programs using Constants, Variables, arithmeticexpression. (b) Develop minimum 3 programs to exhibiting use of increment/decrement operators, data type conversion	CO1, CO2
LSO 2.1. Use scanf statement to take user input. LSO 2.2. Use printf statement to print the output.	2.	(a) Write simple program to convert temperature in Fahrenheit degrees to Centigrade degrees. (take input from the user) (b) Write simple programs to calculate the area and perimeter of the rectangle, and the area & circumference of the circle (take input from the user)	CO1, CO2 CO1, CO2
LSO 3.1. Write C Program using Decision Making and two-way branching statements.	3.	Write program to: (a) Determine whether a given year is a leap year or not. (b) Determine whether a string is palindrome. (c) Find the greatest of the three numbers using conditional operators (d) Find if a given character is vowel (use if-else ladder).	CO1, CO2, CO3
LSO 4.2. Write C Program using "switch-case" statement for multi-way branching. LSO 4.2. Use the "if" and "Switch" statements appropriately for decision making in C Program.	4.	Using switch statement- Write program to: (a) Print day of week by taking number from 1 to 7. (b) Print a student's grade ("A", "B", "C" etc.) by accepting his/her percent marks. (c) Find if a given character is vowel. (d) Using "if" and "switch" statements-	CO1, CO2, CO3

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
		Write programs to check whether the triangle is equilateral, isosceles, or scalene triangle.	
LSO 5.1 Write and execute C programs using various types of loop statements to solve iterative problems.	5.	Write Program to: (a) Find sum of digits of a given number. (b) Generate multiplication table up to 10 for numbers 1 to 5. (c) Find Fibonacci series for given number. (d) Write a program to produce the following output: 1 2 3 4 5 6 7 8 9 10	CO1, CO2, CO3
LSO6.1 Write and execute C programs using one-dimension array. LSO 6.2 Write and execute C program using two-dimensional array.	6	Develop a Program to: (a) Sort list of 10 numbers. (b) Perform addition of 3x3 matrix.	CO1, CO2, CO3, CO4
LSO 7.1 Write and execute C program using Structures to solve given problem.	7	Develop Program to: (a) Create a structure called "library" to hold details of a book viz. accession number, title of the book, author name, price of the book, and flag indicating whether book is issued or not. Fetch some sample data and display the same. (b) Develop and execute C Program to Add Two Distances given in kilometer-meter Using Structures.	CO1, CO2, CO3, CO4
LSO8.1 Write C program using different types of library functions to solve given problem. LSO8.2 Write C program to Create and use user defined functions	8	Develop Program to demonstrate: (a) Use of all String handling functions. (b) Use of few Mathematical functions. (c) Use of few other miscellaneous functions. Develop a Program to: (a) Create a function to find GCD of given number. Call this function in a program. (b) Find Factorial of given number using recursion.	CO1, CO2, CO3, CO4, CO5
LSO 9.1 Write C program using pointers to manipulate the data by accessing the computer's memory	9	(a) Develop a Program to Print values of variables and their addresses. (b) Develop a Program to Find sum of all elements stored in given array using pointers.	CO1, CO2, CO3, CO4, CO6

L) Suggested Term Work and Self Learning: S2418101 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

Use the features of Arrays and Structure appropriately for following problems:

1. Prepare sample mark sheet for 10 students.
2. Generate salary slips of employees in an organization.
3. Develop book issue system of library.
4. Design a basic calculator program that performs arithmetic operations like addition, subtraction, multiplication, and division based on user input.
5. Any other micro-projects suggested by subject faculty on similar line.
   (Use structure/ Text file and other features of 'C' to develop above listed applications)

c. Other Activities:

1. Seminar Topics: suggested few sample topics are given below. Teachers are suggested to find more topics for seminar presentations.
   - Application of pointers in C
   - C date/time functions

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	15%	10%	15%	17%	17%	10%	17%
CO-2	10%	10%	10%	17%	17%	10%	17%
CO-3	20%	25%	15%	17%	17%	25%	17%
CO-4	20%	25%	20%	17%	17%	25%	17%
CO-5	20%	20%	20%	17%	17%	20%	17%
CO-6	15%	10%	20%	15%	15%	10%	15%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

***:** Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

******: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) **Suggested Specification Table for End Semester Theory Assessment:** Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Program Logic Development	6	CO1	7	2	2	3
Unit-2.0 Basics of C programming	4	CO2	7	2	2	3
Unit-3.0 Control Structures	10	CO3	18	6	4	8
Unit-4.0 Array and Structure	10	CO4	17	4	2	11
Unit-5.0 Functions	10	CO5	14	4	2	8
Unit-6.0 Pointers	8	CO6	7	2	2	3
Total	**48**	**-**	**70**	**20**	**14**	**36**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	(a) Develop minimum 3 programs using Constants, Variables, arithmeticexpression. (b) Develop minimum 3 programs to exhibiting use of increment/decrement operators, data type conversion	CO1, CO2	30	60	10
2.	(a) Write simple program to convert temperature in Fahrenheit degrees to Centigrade degrees. (take input from the user) (b) Write simple programs to calculate the area and perimeter of the rectangle, and the area & circumference of the circle (take input from the user)	CO1, CO2	40	50	10
3.	Write program to: (a) Determine whether a given year is a leap year or not. (b) Determine whether a string is palindrome. (c) Find the greatest of the three numbers using conditional operators (d) Find if a given character is vowel (use if-else ladder).	CO1, CO2, CO3	30	60	10
4.	Using switch statement- Write program to: (a) Print day of week by taking number from 1 to 7. (b) Print a student's grade ("A", "B", "C" etc.) by accepting his/her percent marks. (c) Find if a given character is vowel. (d) Using "if" and "switch" statements- Write programs to check whether the triangle is equilateral, isosceles, or scalene triangle.	CO1, CO2, CO3	30	60	10
5.	Write program to: (a) Find sum of digits of a given number.	CO1, CO2, CO3	30	60	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
	(b) Ge 1 o 10 for numbers 1 to 5. (c) Fi 2 3 nber. (d) W 4 5 6 llowing output: 7 8 9 10				
6.	Develop a Program to: (a) Sort list of 10 numbers. (b) Perform addition of 3x3 matrix.	CO1, CO2, CO3, CO4	30	60	10
7.	Develop Program to: (a) Create a structure called "library" to hold details of a book viz. accession number, title of the book, author name, price of the book, and flag indicating whether book is issued or not. Fetch some sample data and display the same. (b) Develop and execute C Program to Add Two Distances given in kilometer-meter Using Structures.	CO1, CO2, CO3, CO4	30	60	10
8.	Develop Program to demonstrate: (a) Use of all String handling functions. (b) Use of few Mathematical functions. (c) Use of few other miscellaneous functions. Develop a Program to: (a) Create a function to find GCD of given number. Call this function in a program. (b) Find Factorial of given number using recursion.	CO1, CO2, CO3, CO4, CO5	40	50	10
9.	(a) Develop a Program to Print values of variables and their addresses. (b) Develop a Program to Find sum of all elements stored in given array using pointers.	CO1, CO2, CO3, CO4, CO6	40	50	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ ImplementationStrategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Portfolio Based Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field, Information and Communications Technology (ICT) Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Sessions, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Computer system	(Any computer system with basic configuration)	All
2.	'C' Compiler	Any C compiler for ANSI C	All

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Programming in ANSI C	Balagurusamy, E.	McGraw Hill Education, New Delhi 2019, ISBN-13: 978-9351343202 ISBN: 978-1259004612
2.	The C Programming Language	Brian, W. Kernighan, Ritchie Dennis	PHI Learning Private Limited, New Delhi 1990, ISBN13: 9789332549449, ISBN10: 9332549443
3.	Let us C	Kanetkar, Yashawant	BPB Publications, New Delhi 2020, ISBN-10: 9389845688 ISBN-13: 978-9389845686

(b) Online Educational Resources:

1. http://nptel.ac.in/courses/106105085/4
2. www.w3schools.com
3. www.programiz.com/c-programming
4. https://www.codecademy.com/courses/getting-started-v2/0/1
5. http://spoken-tutorial.org/

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

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A) Course Code : 2418102(T2418102/P2418102/S2418102)

B) Course Title : Web Technology (CSE, AIML)

C) Pre- requisite Course(s) :

D) Rationale :

Web Technology refers to the various tools and techniques that are applied in the process of conversation between different types of devices over the internet. One of the essential components of this technology is website. Website design is a broad term that encompasses a wide variety of tasks, all involved in the formation of web pages.

In order to make websites look and function a specified way, web developers utilize different languages. The three core languages that make up the World Wide Web are HTML, CSS, and JavaScript.

HTML is a markup language used to create the structure and look of web page and website, from the headings, to the paragraphs, the body, links, and images

This course introduces web page design using HTML5 and also give emphasis on learning Cascading Style Sheets (CSS) which is a style sheet language used for describing the presentation of a document written in a markup language for formatting and styling of content. JavaScript is most commonly used to make DHTML by adding client-side interaction to HTML pages with user's interaction. This learning enables students to design basic interactive web sites and host it on Internet/Intranet.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to performvarious activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

- **CO-1** Create and link web pages using block level and text level formatting tags
- **CO-2** Organize the content using table and frames.
- **CO-3** Apply presentation schemes on content using CSS.
- **CO-4** Create interactive web pages using basic JavaScript.
- **CO-5** Use objects and events in JavaScript

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	1	-	-	1	-	-	1		
CO-2	1	1	1	1	-	-	1		
CO-3	1	1	2	1	-	-	1		
CO-4	1	2	2	1	-	-	1		
CO-5	1	2	2	1	-	-	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by the respective program coordinator at the institute level. As per the latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2418102	Web Technology	03	-	04	02	09	06

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2418102	Web Technology	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2418102

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain the working of Client server model. *TSO 1b.* Differentiate characteristics of the given type of web sites *TSO 1c.* host a website on webserver *TSO 1d.* Explain use of head tag and body tag in the given web page. *TSO 1e.* Write HTML codes to format text and page using block level and text level tags on a web page. *TSO 1f.* USe given type of list tag in Web Pages	**Unit-1.0 Fundamentals of World Wide Web (www) and HTML** Information about Web Browsers, URL, Web page, Web site, types of sites. Static vs. dynamic web sites Client-server model, Web Servers, Website Hosting: Concept of Internet and Intranet. Publishing website on Intranet, Installing and configuring web server **1.1 HTML** HTML documents, Web page structure: Tags and attributes, DOCTYPE, head, body, title and other meta tags with attributes. **1.2 Block Level Tags:** Headings, Paragraphs, Breaks, Divisions, Centered Text, Block Quotes, Preformatted text, HR tag. **1.3 Text Level Tags and Special Characters:** Bold, Italic, Underline, Strikethrough, Superscript, Subscript, DIV tag, displaying special characters. **1.4 Lists:** Ordered Lists, Unordered Lists, Definition Lists, Nested Lists.	**CO-1**
TSO 2a. Describe feature of the given type of URL. *TSO 2b.* Use Image Insert and format tags on a web page. *TSO 2c.* Write HTML codes for setting background on a Web Page using the given colors/images. *TSO 2d.* Write HTML codes for creating the given type of hyper linking. *TSO 2e.* Write HTML codes to create and format table to organize data on a web page. *TSO 2f.* Use frames to organize web page display as per given screen layout.	**Unit-2.0 URL, Image, Table and Frame in HTML** **2.1 URL And Anchor Tag:** URL: Types of URLs, pros and cons of relative and absolute URLs, Anchor Tag: Linking various documents for internal and external links, linking to area in same page, linking to other page on specific area. **2.2 Images, Colors and Backgrounds:** Inserting Images, formatting image for sizing, alignment. Border and using other attributes with IMG tag. Inserting image as page background. Creating solid color page background. **2.3 Table**: Table tag with attributes. TABLE, TR, TH, TD tags. Border, cell spacing, cell padding, width, align, bgcolor attributes. **2.4 Frames: Types** of Frames with their attributes, Creating frames: FRAMESET tag – rows, cols attributes.	**CO-2**
TSO 3a. Write CSS code to implement given type of document style on a web page. *TSO 3b.* Use different style sheet properties. *TSO 3c.* Create and use internal CSS file *TSO 3d.* Create and use external CSS file *TSO 3e.* Create CSS for applying the given presentation scheme on a web page.	**Unit-3.0 Cascading Style Sheets** **3.1** Basics of CSS: Different types of Style Sheets, Benefits of using CSS. Adding style to the document: Linking to style sheets, embedding style sheets, Using inline style, Selectors: CLASS rules, ID rules. **3.2 Style sheet properties:** Font, text, box, color and background properties; Creating and Using a simple external CSS file; Using the internal and inline CSS; background and color gradients in CSS Setting font and text in style sheet using table layout.	**CO-3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 4a. Write and execute JavaScript codes. *TSO 4b.* Use JavaScript to perform arithmetic operations on variables. *TSO 4c.* Write JavaScript codes to implement decision making statements for solving the given problem. *TSO 4d.* Implement loop statements to solve the given iterative problem. Using JavaScript codes *TSO 4e.* Create and use arrays in JavaScript. *TSO 4f.* Use JavaScript popup boxes for taking user's input *TSO 4g.* Use JavaScript popup boxes to alert and prompt user.	**Unit-4.0 Basic JavaScript** **4.1 JavaScript Introduction:** writing and executing JavaScript codes, variables, data types, operators, Pop-up boxes- Alert, confirm and prompt boxes **4.2 Control structure:** control flow- if-else, switch, for, while, do…while loops break and continue statements, Arrays	**CO-4**
TSO 5a. Create and call user defined functions using JavaScript. *TSO 5b.* Use different JavaScript objects. *TSO 5c.* Write JavaScript to handle various events.	**Unit-5.0 Java Script Function, Objects and Events** **5.1 Functions:** Declaring Functions, calling functions with parameters, lifetime of JavaScript variables, JavaScript Objects, String, Date and Math objects, **5.2 Events and exceptions**: JavaScript events, error and exception handling, the try...catch...finally Statement, onerror() Method	**CO-5**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical:

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. create static web pages using block level and text level HTML tags	1	Create a static web page to display sample content using- a) block level HTML tags b) Text level HTML tags	CO-1
LSO 2.1. Create web pages using ordered and unordered list LSO 2.2. Create different types of hyperlinking on web page.	**2**	a) Create a web page for implementing different types of Lists b) Create a web page to link- i) An external page of different web site ii) A specific location on the same page iii) A specific location of an external page c) Write HTML tags to change colors of links (visited, unvisited etc.)	CO-2
LSO 3.1. Insert images on web page and adjust its appearance and style. *LSO 3.2.* Organize content in specified tabular form in a web page	**3**	a) Write HTML codes to- i) Insert images on web page using various attributes ii) Insert image as page background	CO-2

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 3.3. Use frame tag to split the web browser display		b) Create a web page to demonstrate use of various Table tags. **c)** Create a web page to implement Frame tags	
LSO 4.1 Create Cascading style sheet as per given scheme and apply it on different web pages	**4**	a) Create CSS for applying the given presentation scheme on a web page. b) Create a web page for demonstration of CSS by applying Internal/External/ Inline style on sample content	CO-3
LSO 5.1. Install/Configure web server and publish a website on it	**5.**	a) Install a web server and publish a website on Intranet b) Publish a website on Internet by acquiring space on a free hosting site.	CO-1
LSO 6.1. Write, execute and debug simple JavaScript programs	6.	Develop minimum 2 programs using JavaScript to demonstrate use of Variables, arithmetic expressions.	CO-4
LSO 7.1. Use JavaScript decision making statements for two-way branching *LSO 7.2.* Use JavaScript decision making statements for multi-way branching.	7.	a) Write JavaScript to implement following i) Get the system time. If the time is less than 12, you will get a "Good morning" greeting otherwise you will get a "Good day" greeting ii) Write simple programs to check if income is less than 10000/- then print “below poverty line”. b) Write JavaScript code to implement following- Take the user input in number between 1-7 and write the day (Consider the Day 1 as “Monday”….Day 7 as “Sunday”). Also validate the user’s input. c) Take input of six courses marks out of 50. Validate the user’s input. Write the total marks and percentage marks. d) Take input of 10 Employees id, name, annual salary. Calculate the tax based on the following criteria- i) tax= 3% of the salary, if salary is equal to or greater than 10 lakhs ii) tax= 5% of the salary, if salary is equal to or greater than 15 lakhs iii) tax= 8% of the salary, if salary is equal to or greater than 20 lakhs.	CO-4
LSO 8.1. Write C Program using Decision Making and two-way branching statements.	8.	(a) Create sample webpages and use JavaScript to demonstrate the use of built-in functions. (b) Develop webpages to demonstrate creation and calling of user-defined functions with parameters in JavaScript. (c) Develop sample webpages to demonstrate use of JavaScript Array, Date, Math, and String objects.	CO-4, CO-5

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
		(d) Develop web pages to demonstrate use of JavaScript vents, (e) Create web pages to demonstrate use of exception handling and error handling using JavaScript	

NOTE: Students are advised to practice all the examples covered by teachers in the input sessions.

L) Suggested Term Work and Self Learning: Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in linewith the targeted COs.

b. Micro Projects:

1. Prepare a webpage that display list of all laboratories in the institute as menu and details of each lab on clicking the corresponding lab title.
2. Creating a static page displaying the details of an event (could be conference, webinar, sports events, etc.)
3. Create a restaurant menu page
4. Create students marksheet by taking input of marks (with validity check).
5. Crate salary slip by taking inputs from the user (with validity check)
6. Any other micro-projects suggested by subject faculty on similar line.

c. Other Activities:

Seminar Topics:

- Different web technology platforms
- Blog creating tools
- Content management systems

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	15%	15%	15%	20%	20%	15%	20%
CO-2	15%	15%	10%	20%	20%	15%	20%
CO-3	20%	20%	15%	20%	20%	20%	20%
CO-4	25%	25%	30%	20%	20%	25%	20%
CO-5	25%	25%	30%	20%	20%	25%	20%
Total Marks	30	70	20	20	10	20	30
			50				

Legend:

* : Other Activities include self-learning, seminar, visits, surveys, product development, software development etc.

** : Mentioned under point- (N)

: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Fundamentals of World Wide Web (www) and HTML	8	CO1	10	3	2	5
Unit-2.0 Image, table and frame in HTML	8	CO2	10	4	4	2
Unit-3.0 Cascading Style Sheets	10	CO3	14	4	4	6
Unit-4.0 Basic JavaScript	12	CO4	18	5	6	7
Unit-5.0 Java Script Function, objects and events	10	CO5	18	4	6	8
Total	**48**	**-**	**70**	**20**	**22**	**28**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Create a static web page to display sample content using- a) block level HTML tags Text level HTML tags	CO-1	30	60	10
2.	a) Create a web page for implementing different types of Lists b) Create a web page to link- i) An external page of different web site ii) an email ID iii) A specific location of a page Write HTML tags to change colors of links (visited, unvisited etc.)	CO-1 CO-2	40	50	10
3.	a) Write HTML codes to- i) Insert images on web page using various attributes ii) Insert image as page background iii) Create a web page to demonstrate use of various Table tags. iv) Create a web page to implement Frame tags	CO-2	40	50	10
4.	a) Create CSS for applying the given presentation scheme on a web page. b) Create a web page for demonstration of CSS by applying Internal/External/ Inline style on sample content	CO-3	30	60	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
5.	a) Install a web server and publish a website on Intranet b) Publish a website on Internet by acquiring space on a free hosting site.	CO-1	30	60	10
6.	Develop minimum 2 programs using JavaScript to demonstrate use of Variables, arithmetic expressions.	CO-4	30	60	10
7.	e) Write JavaScript to implement following - i) Get the system time. If the time is less than 12, you will get a "Good morning" greeting otherwise you will get a "Good day" greeting ii) Write simple programs to check if income is less than 10000/- then print “below poverty line”. f) Write JavaScript code to implement following- Take the user input in number between 1-7 and write the day (Consider the Day 1 as “Monday”….Day 7 as “Sunday”). Also validate the user’s input. g) Take input of six courses marks out of 50. Validate the user’s input. Write the total marks and percentage marks. h) Take input of 10 Employees id, name, annual salary. Calculate the tax based on the following criteria- i) tax= 3% of the salary, if salary is equal to or greater than 10 lakhs ii) tax= 5% of the salary, if salary is equal to or greater than 15 lakhs iii) tax= 8% of the salary, if salary is equal to or greater than 20 lakhs.	CO-4	30	60	10
8.	a) Create sample webpages and use JavaScript to demonstrate the use of built-in functions. b) Develop webpages to demonstrate creation and calling of user-defined functions with parameters in JavaScript. c) Develop sample webpages to demonstrate use of JavaScript Array, Date, Math, and String objects. d) Develop web pages to demonstrate use of JavaScript events, e) Create web pages to demonstrate use of exception handling and error handling using JavaScript	CO-5	40	50	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to beprepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Portfolio Based Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field, Information and Communications Technology (ICT) Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Sessions, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Computer system With network and internet connectivity	(Any computer system with basic configuration)	All
2.	Web Browser	Any web browser such as Google Chrome, Safari, Mozilla Firefox, Microsoft edge	All

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Mastering HTML, CSS & JavaScript Web Publishing	Laura Lemay, Rafe Colburn, Jennifer Kyrnin	BPB Publications, ISBN-8183335152
2.	Learning JavaScript with HTML 5	Ramesh Bangia	Khanna Book Publishing, ISBN: 9381068895, ISBN-13: 978-9381068892
3	JavaScript for Modern Web Development	Alok Ranjan, Abhilasha Sinha, Ranjit Battwad	BPB Publications, ISBN-10: 9389328721 ISBN-13: 978-9389328721
4	HTML 5 Black Book	DT Editorial Services	Dreamtech Press, ISBN-10 : 935119907X, ISBN-13 : 978-9351199076

(b) Online Educational Resources:

1. https://nptel.ac.in/courses/106105084
2. www.w3schools.com
3. www.programiz.com/html
4. https://www.codecademy.com
5. http://spoken-tutorial.org/

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested Online educational resource, before use by the students.

******

A) Course Code **: 2400103B(T2400103B/P2400103B/S2400103B)**

B) Course Title **:** Applied Chemistry- B (CSE, AIML, EE, ELX, ELX (R))

C) Pre- requisite Course(s) **:**

D) Rationale **:**

The diploma programmes in Computer Science and Engineering (CSE), Artificial Intelligence and Machine Learning (AIML), Electrical Engineering, and Electronics Engineering all require applied chemistry course as prerequisite. The fundamental tenets of chemistry, such as chemical bonding, water, engineering materials, solid state and electrochemistry are the main topics of the applied chemistry course which are the need for programmes mentioned above. Through this course, they will be able to understand structural arrangement of fundamental particles, atoms and molecules. The knowledge of chemical bonding will help the engineers and scientist to design new engineering materials and form chemical compounds with desirable properties. The study of basic concept of solid state will be needed in various emerging and technological applications.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Solve various engineering problems applying the basic concepts of atomic structure, chemical bonding, and solutions.

CO-2 Use relevant **water treatment** techniques to solve domestic and industrial problems.

CO-3 Solve emerging problems using concept of engineering materials and properties.

CO-4 Analyze the behavior of given materials under different temperature and pressure conditions.

CO-5 Solve the engineering problems using the concept of electrochemistry and corrosion.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Developmen tof Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	2	1	-	-	-	1		
CO-2	3	3	2	2	2	1	1		
CO-3	3	2	1	2	-	1	1		
CO-4	3	1	1	-	2	-	1		
CO-5	3	2	1	1	-	1	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by the respective program coordinator at the institute level. As per the latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

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		L	T				
2400103B	Applied Chemistry- B	03	-	04	02	09	06

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

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C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
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		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400103B	Applied Chemistry- B	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

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TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
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I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400103B

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Describe the three subatomic particles in an atom. *TSO 1b.* Explain Rutherford model of atom. *TSO 1c.* Apply the different atomic theories and principles for structural illustration. *TSO 1d.* Calculate uncertainty in position and momentum. *TSO 1e.* Draw the shapes of s, p and d orbitals. *TSO 1f.* Write the electronic configuration of different elements. *TSO 1g.* Differentiate between ionic, covalent, and coordinate compounds based on the type of chemical bonding. *TSO 1h.* Explain the unique behavior of water. *TSO 1i.* Prepare the solution of given concentration.	**Unit-1.0 Atomic Structure and Chemical Bonding and Solutions:** 1.1. Atoms and its fundamental particles, 1.2. Rutherford Model of Atom, 1.3. Bohr's Theory, Hydrogen spectrum explanation based on Bohr's Model of Atom, 1.4. Wave Mechanical model of atom, de Broglie relationship, Heisenberg Uncertainty Principle 1.5. Quantum Numbers, Shapes of Atomic Orbitals, 1.6. Pauli's Exclusion Principle, Hand's Rule of Maximum Multiplicity, Aufbau Principle, Electronic Configuration (till atomic number 30). 1.7. Concept of Chemical bonding - Causes of chemical bonding, Types of Bonds: Ionic Bond (NaCl, $CaCl_2$, MgO), Covalent Bond, Polar and Nonpolar Covalent Bonds (H_2. F_2. HF, HCl) & Co-ordinate Bond (CO, NH_4+, O_3, H_2SO_4). 1.8. Dipole Moment (NH_3, NF_3), Hydrogen bonding. 1.9. Solution- (solute, solvent) and their strength- Molarity, Normality, Molality. 1.10. Indian Chemistry: -Philosophy of atom by Acharya Kanad. (IKS)	**CO1**
TSO-2a. Classify hard and soft water based on their properties. *TSO-2b.* List the impurities responsible for hardness. *TSO-2c.* Calculate the hardness of water. *TSO-2d.* Determine the hardness by EDTA method. *TSO-2e.* Apply different water softening techniques to soften the hard water. *TSO-2f.* Calculate the amount of lime and soda required for removal of hardness. *TSO-2g.* Differentiate between BOD and COD. *TSO-2h.* Use the Indian standard specification of drinking water.	**Unit-2.0 Water** 2.1 Introduction, Sources of Water. Hardness of Water- Temporary & Permanent hardness. 2.2 Degree of Hardness (In terms of CaCO3 equivalent), Unit of Hardness, Quantitative Measurement of Water Hardness by EDTA method. 2.3 Municipal supply of Water, Treatment of water, Water Softening Technique-Soda Lime Process, Zeolites method and ion exchange method, 2.4 Water Quality Index - Biological Oxygen Demand, Chemical Oxygen Demand, Determination of Dissolved Oxygen 2.5 Indian standard specification of drinking water.	**CO2**
TSO 3a. List ores of metals. *TSO 3b.* Describe ore, gangue, matrix. *TSO 3c.* Select Appropriate metallurgical processes for concentration, extraction, and purification of given ore. *TSO 3d.* Describe alloy with examples. *TSO 3e.* Write the constituent of given alloy. *TSO 3f.* Write the composition properties and	**Unit-3.0 Engineering Materials** 3.1 Natural Occurrence of Metals- Minerals, ores. 3.2 Metallurgy - General principles of Metallurgy, Gangue, Flux and Slag, Steps involved in metallurgy. 3.3 Ancient Indian Metallurgy (IKS) 3.4 Extraction of Aluminium, Iron and Copper from their important ores along with reactions,	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
uses of ferrous and non-ferrous alloys. *TSO 3g.* Distinguish homopolymer, copolymer. *TSO 3h.* Write the monomers of given polymers. *TSO 3i.* Explain vulcanization process.	Properties and uses. 3.5 Alloys – Definition, Purpose of alloying, Ferrous and Non-Ferrous Alloy with suitable examples, Composition, Properties, and their applications. 3.6 Polymers-Homopolymers and Copolymers, Natural polymers and synthetic polymers, Addition and Condensation polymerization, Thermoplastic and Thermosetting plastic. 3.7 Monomers, applications, and synthesis of Polythene, PVC, Orlon, Terylene, Nylon 66, Nylon 6, Bakelite. 3.8 Natural Rubber and its vulcanization, advantages of vulcanized rubber.	
TSO 4a. Differentiate between crystalline and amorphous solid. *TSO 4b.* Classify crystalline solid based on binding forces. *TSO 4c.* Classify unit cells based on structure. *TSO 4d.* Describe imperfections in solid. *TSO 4e.* Differentiate between metals and semiconductors using band theory. *TSO 4f.* Explain ferromagnetism and diamagnetism. *TSO 4g.* Describe Bragg's law. *TSO 4h.* Describe kjeldahl method to determine melting point of crystalline solid.	**Unit-4.0 Solid State** 4.1 General characteristics of solid state, crystalline and amorphous solid. 4.2 Classification of crystalline solid- Molecular, ionic, metallic, covalent solids. 4.3 Crystal lattice and unit cells- Primitive, BCC, FCC 4.4 Imperfections of solid, Types of point defects- stoichiometric defects, impurity defects, non-stoichiometric defects. 4.5 Electrical properties, conduction of electricity in metals and semiconductors- Band theory. 4.6 Magnetic properties- Ferromagnetism, Para magnetism, diamagnetism, anti-ferro magnetism and ferrimagnetism. 4.7 General introduction to X ray diffraction method- *Bragg's* law. **4.8** Melting point determination of crystalline solid by Kjeldahl method.	
TSO-5a. Describe Electrolyte and Nonelectrolyte. *TSO-5b.* Describe Metallic and electrolytic conduction. *TSO-5c.* Explain the faraday law of electrolysis. *TSO-5d.* Calculate the mass of metal deposited after passing a certain amount of current. *TSO-5e.* Calculate the emf at different temperature, pressure, and molar concentration. *TSO-5f.* Predict the feasibility of a cell. *TSO-5g.* Explain the working of a cell. *TSO-5h.* Describe corrosion. *TSO-5i.* Explain the different methods to prevent corrosion.	**Unit-5.0 Electrochemistry** 5.1. Introduction, Electrolyte and Nonelectrolyte, Electrolytic and Metallic Conduction, Factors affecting Electrolytic Conductance. 5.2. Molar Conductivity and Equivalent Conductivity. Variation of Molar Conductivity, Kohlrausch's law. 5.3. Faraday's Laws of Electrolysis. 5.4. Galvanic Cell, Electrode Potential, Measurement of Electrode Potential SHE (Standard Hydrogen electrode), EMF, Electrochemical Series, Nernst Equation for Electrode Potential. 5.5. Batteries, Primary Cells-Dry cell, Secondary cell -Lead storage battery, Fuel cells. 5.6. Corrosion, their types (Dry & Wet corrosion) and prevention.	**CO5**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400103B

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Calculate amount of oxalic acid required. *LSO 1.2.* Prepare N/10 oxalic acid solution.	1.	Preparation of 250 ml of N/10 Oxalic acid Solution	CO1
LSO 2.1. Calculate amount of Sodium carbonate required. *LSO 2.2.* Prepare N/10 Sodium Carbonate Solution	2.	Preparation of 250ml of N/10 Sodium Carbonate Solution	CO1
LSO 3.1. Perform acid base titration. *LSO 3.2.* Prepare oxalic acid solution.	3.	Determination of strength of Sodium Hydroxide solution by titrating against Oxalic Acid Solution.	CO1
LSO 4.1. Perform Complexometric titration. *LSO 4.2.* Standardize EDTA solution.	4.	Determination of the total hardness of tap water by EDTA method.	CO2
LSO 5.1. Perform double displacement reaction. *LSO 5.2.* Test the presence of sulphate.	5.	Preparation Barium Sulphate from Barium Chloride.	CO2
LSO 6.1. Perform acid base titration using pH meter.	6.	Determination of pH of given solution by pH meter.	CO2
LSO 7.1. Perform iodometry titration. *LSO 7.2.* Use of starch as indicator.	7.	Determination of Dissolved Oxygen in given Sample of water.	CO2
LSO 8.1. Calculate pH.	8.	Determination pH of soil using baking soda and vinegar.	CO2
LSO 9.1. Carry out Polymerization. *LSO 9.2.* Set the environment for carrying out polymerization	9.	Preparation of Phenol Formaldehyde Resin (Bakelite)	CO3
LSO-10.1. Seal capillary tube. *LSO 10.1.* Measure the melting point of acetanilide.	10.	Determination of the melting point of Acetanilide crystals.	CO4
LSO 11.1. Seal capillary tube *LSO 11.2.* Measure the melting point of benzoic acid.	11.	Determination of the melting point of Benzoic acid crystals.	CO4
LSO-12.1. Construct Daniel cell. *LSO-12.2.* Compare the effect of dilution of electrolytes on the emf of a Daniel cell.	12.	Comparison of the effect of dilution of electrolytes on the emf of a Daniel cell.	CO5

L) **Suggested Term Work and Self Learning: S2400103B** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted Cos such as

1. Write electronic structure of given atoms.
2. Compare the wavelengths of different macroscopic and microscopic particles moving with same velocity.
3. Prepare a model to find the soap lather forming capacity of tap water on addition of lime.
4. Prepare chart showing different industrial application of metal and relate it with required property or properties using internet.
5. Compare the EMF of Zinc - Copper cell with different cathodic concentration and predict which increases EMF out of low and high cathodic concentration?
6. Explain different types of defects in solid with diagram.
7. Identify polymers used at your home and institute and write their monomers.
   Prove the statement mathematically. "It is impossible to determine the position and momentum simultaneously with accuracy."

b. Micro Projects:

1. Form three groups of students in the class. Consider a hypothetical situation of exchanging/ sharing/giving of different items/belongings and demonstrate the type of ionic, covalent, and co-ordinate bonding amongst the students in a simulated situation. Present your findings.
2. Model of electronic configurations for different atoms (Z=30)
3. Prepare a model to demonstrate the application of electrolysis cells.
4. Collect three metallic strips of Al, Cu, Fe, strips, Place them in different acidic and alkaline solutions of the same concentration. Observe and record the loss in weight of metals due to acidic and alkaline environments. Discuss the findings with your teacher and colleagues.
5. Classify the surrounding corrosion into dry corrosion and wet corrosion.
6. Collect different samples of utensils reinforced materials, iron, copper, brass, bronze, and other alloys. Place them in an open environment under tin shade. Observe the corrosive properties over a period of four weeks. Record your observations. Discuss the findings with your teacher and colleagues.
7. Collect the water sample from different sources of ground and surface water (at least five). Explore the new and simplest softening and **water treatment** methods and perform the same at your home by creating the different assemblies and manipulative techniques at home. Determine the turbidity and pH of water (using pH paper).
8. Collection of data of various cement, glass, paints, and varnishes available in the market.
9. Compare the EMF of a given cell using different fruit juice as electrolyte.
10. Compare the hardness of different sample water by measuring the time required for forming lather.

c. Other Activities:

1. Seminar Topics:
   - Water Softening techniques.
   - Advantages and drawbacks of different atomic structures proposed by different scientists.
   - Properties of good lubricants.
   - Application of Nernst equation

2. Visits:
   - Visit nearby **water treatment** plant and prepare a report of the visit.

- Visit a nearby battery shop and prepare a report of the visit.

3. Self-Learning Topics:
   - Type of hardness.
   - Discovery of electrons, proton, and neutron.
   - Blast furnace.
   - Octane number and cetane number.

M) **Suggested Course Evaluation Matrix:** The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	20%	20%	15%	-	-	20%	20%
CO-2	20%	20%	10%	25%	-	20%	20%
CO-3	20%	20%	15%	25%	33%	15%	20%
CO-4	15%	15%	30%	25%	33%	15%	20%
CO-5	25%	25%	30%	25%	34%	30%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) **Suggested Specification Table for End Semester Theory Assessment:** Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Atomic Structure and Chemical Bonding	11	CO1	14	4	4	6
Unit-2.0 Water	9	CO2	14	4	4	6
Unit-3.0 Engineering Material	8	CO3	14	4	6	4
Unit-4.0 Solid state	8	CO4	10	4	3	3
Unit-5.0 Electrochemistry	12	CO5	18	4	5	9
Total	**48**		**70**	**20**	**22**	**28**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Preparation of 250 ml of N/10 Oxalic acid Solution	CO1	40	50	10
2.	Preparation of 250ml of N/10 Sodium Carbonate Solution.	CO1	30	60	10
3.	Determination of strength of Sodium Hydroxide solution by titrating against Oxalic Acid Solution.	CO1	30	60	10
4.	Determination of the total hardness of tap water by EDTA method.	CO2	30	60	10
5.	Preparation Barium Sulphate from Barium Chloride.	CO2	30	60	10
6.	Determination of pH of given solution by pH meter.	CO2	40	50	10
7.	Determination of Dissolved Oxygen in given Sample of water.	CO2	30	60	10
8.	Determination pH of soil using baking soda and vinegar.	CO2	30	60	10
9.	Preparation of Phenol Formaldehyde Resin (Bakelite)	CO3	30	60	10
10.	Determination of the melting point of Acetanilide crystals.	CO4	40	50	10
11.	Determination of the melting point of Benzoic acid crystals.	CO4	40	50	10
12.	Comparison of the effect of dilution of electrolytes on the emf of a Daniel cell	CO5	40	50	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools, and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	Electronic balance,	Scale range of 0.001g to 500g. Pan size 100 mm; response time 3-5 sec.; power requirement 90-250 V, 10 watt.	1,2,3,5,6,7,8,9
2.	Electric oven	Inner size 18''x18''x18''; temperature range 100 to 250^0 C. with the capacity of 40lt.	5
3.	Ostwald Viscometer	Size 120x1 mm(length x internal diameter) Overall Height 237 nm Material- Glass	7

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing Co.(P) Ltd., New Delhi, 2015, ISBN: 93-521-6000-2
2.	A Textbook of Engineering Chemistry	Dr S. S. Dara & Dr S. S. Umare	S. Chand & Co.(P) Ltd., New Delhi, 2014, ISBN:81-219-0359-9
3.	Textbook of Chemistry for Class XI & XII (Part-I & II)	NCERT	NCERT, New Delhi, 2017-18, Class-XI, ISBN: 81-7450-494-X (part-I), 81-7450-535-O (part-II), Class-XII, ISBN: 81-7450-648-9 (part-I), 81-7450-716-7 (part-II)
4.	Engineering Chemistry	Shikha Agarwal	Cambridge Uni. Press, New Delhi, 2019, ISBN: 978-1-108-72444-9
5.	Understanding Chemistry	C.N.R. Rao	World scientific publishing Co., 2009, ISBN: 9789812836045
6.	Engineering Chemistry	Dr. Vikram, S.	Wiley India Pvt. Ltd., New Delhi, 2013, ISBN: 9788126543342
7.	Applied Chemistry Laboratory Practices, Vol. I & II	Dr. G.H. Hunger & Prof. A.N. Pathak.	NITTTR, Chandigarh, Publication, 2013-14
8.	Chemistry for Engineers	Rajesh Agnihotri	Wiley India Pvt. Ltd., 2014, ISBN: 9788126550784
9.	Fundamental of Electrochemistry	V. S. Bagotsky	Wiley International N. J.,2005, ISBN: 9780471700586
10.	Applied Chemistry with Lab manual	Anju Rawlley Devdatta V. Saraf	Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8.

(b) Online Educational Resources:

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)
4. https://www.ancient-origins.net/history-famous-people/indian-sage-acharya-kanad-001399
5. https://www.wastewaterelearning.com/elearning/ (Water Treatment)
6. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
7. www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel & Combustion)
8. PhET: Free online physics, chemistry, biology, earth science and math simulations (colorado.edu)
9. Courses: NPTEL
10. Virtual Labs (vlab.co.in)
11. https://iksindia.org
12. olabs.edu.in
13. Khan Academy | Free Online Courses, Lessons & Practice

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Lab Manuals
2. Learning Packages.
3. Lab Manuals.
4. Manufacturers' Manual
5. Users' Guide

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A) Course Code : 2400104(T2400104/P2400104/S2400104)

B) Course Title : Communication Skills (English) (Common for all Programmes)

C) Pre-requisite Course(s) :

D) Rationale

Communication forms a crucial element in the success of any organization or industry in the globalized economy. The global village gives due weightage to the English language and it enjoys a privileged status. Engineering students with English as a communicative language are open to many opportunities across the globe. This course will develop Listening, Speaking, Reading, and Writing Skills (LSRW) in the students for effective dissemination of their ideas, projects, patents, and research in the form of presentations, reports, research papers, memos, circulars, etc. Additionally, it will help students of diploma in engineering to present concepts and designs effectively along with writing CVs, Group Discussions, and Mock Interview sessions in placements and job recruitments. Though communication skills in SBTE, Bihar largely emphasizes to communicate effectively in English communication in Hindi is also focused to some extent at the diploma level. Effective Communication can be easily learned through Indian mythological scriptures like Bhagwat Geeta, Ramayana, Mahabharata, and others. (IKS)

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of the following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor, and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Communicate contextually in different situations.
CO-2 Use Verbal Communication Effectively
CO-3 Deploy Non-Verbal Communication Contextually.
CO-4 Write various texts using vocabulary and correct grammar.
CO-5 Draft effective business correspondence with brevity and clarity.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Developmentof Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	-	-	-	-	3	3		
CO-2	-	-	-	-	-	3	3		
CO-3	-	-	-	-	-	3	3		
CO-4	-	-	-	-	3	3	3		
CO-5	3	-	-	-	-	3	3		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by the respective program coordinator at the institute level. As per the latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2400104	Communication Skills (English)	03	-	04	02	09	06

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem-based learning, etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field, or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro-projects, industrial visits, any other student activities, etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources, etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of the teacher to ensure the outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400104	Communication Skills (English)	30	70	20	30	20	30	200

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW), and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to the attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020-related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS), and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400104 The details of TSOs and units for communication in English is mentioned in Part – A while communication in Hindi is mentioned in Part – B in the following table.

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
Part -A (English) TSO1.a Define communication and its different forms. TSO1.b Explain the elements of communication with Case Studies from Bhagwat Geeta's conversation between Krishna and Arjun before the war. (IKS) TSO1.c Explain the linkages between different stages of communication with the help of a diagram. TSO1.d Apply the principles of effective communication and state two examples of communication from Ramayana (IKS) TSO1.e State eight for explaining different types of barriers to communication Case Studies from Mahabharata - the conversation between Kauravas and Pandavas in the war field (IKS) TSO1.f Identify the barriers to communication. TSO1.g Suggest the ways to overcome/minimize communication barriers.	**Unit-1.0 Communication** 1.1 Communication: Role, Relevance, Elements (Context-Sender-Message-Channel-Receiver-Feedback) 1.2 Process / Stages: Ideation- Encoding, Selecting Proper Channel, Transmission, Receiving, Decoding, Giving Feedback 1.3 7 Cs / Principles of Effective Communication: Considerate, Correct, Concrete, Concise, Clear, Complete. Courteous 1.4 Barriers to Communication: Physiological, Physical, Psychological, Mechanical, Semantic/Language, Cultural. Overcome/ minimize Barriers. 1.5 Case Studies from: • Bhagwat Geeta's conversation between Krishna and Arjun before the war (IKS) • Mahabharata the conversation between Kauravas and Pandavas in the war field (IKS)	**CO1** **CO2**
TSO 2a. Distinguish between formal and informal communication Case Studies from Bhagwat Geeta and the different conversations of Krishna and Arjun during the war (IKS). *TSO 2b.* Illustrate the types of Formal Communication with examples. *TSO 2c.* Define verbal & non-verbal communication. *TSO 2d.* TSO 2d. Explain the advantages of oral and written Communication. *TSO 2e.* Interpret non-verbal codes from Mahabharata (IKS) *TSO 2f.* Explain the role of tables, charts & graphs in communication. *TSO 2g.* Differentiate Intrapersonal and Interpersonal Communication with Case Studies *TSO 2h.* List the advantages and disadvantages of Group Communication.	**Unit- 2.0 Types of Communication** 2.1 Based on organizational structure: Formal (Vertical, Horizontal, Diagonal), Informal (Grapevine) 2.2 Based on the method of expression: Verbal-Oral & Written communication. Non-verbal communication and its Codes- Kinesics, Chronemics, Proxemics, Haptics, Vocalics/Paralanguage, Artifacts, Graphic and Visual Communication 2.3 Based on the number of people involved: Interpersonal, and Group Communication. 2.4 Case Studies from Bhagwat Geeta's different conversations with Krishna and Arjun during the war (IKS).	**CO3**
TSO 3a. Prepare a glossary of new words from the given texts. TSO 3b. Summarize the given texts in your own words. TSO 3c. Recognize the types of sentences in the given texts.	**Unit-3.0 Reading Comprehension** Comprehension, vocabulary enhancement and grammar exercises based on the reading of the following texts: **Section-1 (Prose)**	**CO4** **CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 3d. Find out idioms and phrases used in the given texts. TSO 3e. Write a short biography of the given writers. TSO 3f. Identify the figures of speech used in the given texts. TSO 3g. Classify the forms of poetry. TSO 3h. Elaborate the central idea / theme of the given poems in your own words.	3.1 An Astrologer's Day by R K Narayan 3.2 Indian Civilization and Culture by M K Gandhi 3.3 The Secret of Work by Swami Vivekanand 3.4 My Struggle for an Education by Brooker T Washington **Section-2 (Poetry)** 3.5 Where the Mind is without Fear by R N Tagore 3.6 Ode on Solitude by Alexander Pope 3.7 Stopping by Woods on a Snowy Evening by Robert Frost 3.8 A Psalm of Life by H W Longfellow	
TSO 4a. Form new words adding prefix and suffix to the given root words. *TSO 4b.* Write synonyms and antonyms of the given words. *TSO 4c.* Use the given idioms and phrases in your own sentences. *TSO 4d.* Distinguish between acronym and abbreviation. *TSO 4e.* Prepare a list of technical jargons of your respective branch. *TSO 4f.* Identify the parts of speech of the specific words in the given sentences. *TSO 4g.* Fill in the blanks with suitable verb forms in the given sentences. *TSO 4h.* Transform the given sentences as directed. *TSO 4i.* Punctuate the given paragraphs.	**Unit-4.0 Vocabulary and Grammar** 4.1 Word Formation: Prefix, Suffix, Acronym 4.2 Synonyms, Antonyms, Homonyms, One Word Substitution, Idioms and Phrases 4.3 Technical Jargons -Related to the respective program 4.4 Parts of speech 4.5 Time and Tense 4.6 Transformation: Voice, Narration, Removal of 'Too', Question Tag 4.7 Punctuation	**CO4, CO5**
TSO 5a. Write the precis of the given passage with suitable title. TSO 5b. Draft letters and applications for the given purpose. TSO 5c. Compose E-mails, Notices, Memos, and Circulars. TSO 5d. Prepare reports of the projects of your respective branch. TSO 5e. Write a report on the events organized in your institute.	**Unit-5.0 Professional Writing** 5.1 Precis Writing 5.2 Business Letters / Applications 5.3 Drafting E-mails, Notices, Memos, Circulars 5.4 Report Writing: Project and Event/ Incident Report Writing	**CO5**
Part -B (हिंदी) *TSO 1a* सम्प्रेषण कौशल का अर्थ स्पष्ट कर सकेंगे. *TSO 1b* भाव एवं सम्प्रेषण में अंतर बता पाएँगे. *TSO 1c* सम्प्रेषण की प्रक्रिया का उल्लेख कर सकेंगे. *TSO 1d* श्रवण अविव्यक्ति, वाचन और लेखन की अवधारणा को स्पष्ट कर सकेंगे. *TSO 1e* सम्प्रेषण कौशल के निर्धारिक तत्वों का विवेचन कर सकेंगे. *TSO 1f* प्रभावशाली सम्प्रेषण के सिद्धांतों का समावेश अपने वार्तालाप में कर सकेंगे.	**Units-1.0: सम्प्रेषण सिद्धान्त एवं व्यवहार** 1.1 सम्प्रेषण : परिचय , अर्थ एवं परिभाषा 1.2 सम्प्रेषण की प्रक्रिया एवं तत्त्व 1.3 सम्प्रेषण के प्रकार : औपचारिक एवं अनौपचारिक, शाब्दिक एवं अशब्दिक 1.4 प्रभावशाली सम्प्रेषण के सिद्धांत एवं सम्प्रेषण व्यवधान कुरुक्षेत्र में श्रीकृष्ण- अर्जुन संवाद	**CO1, CO2, CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	महाभारत युद्ध प्रारम्भ होने से पहले कुरुक्षेत्र में श्री कृष्ण ने अर्जुन के प्रश्नों के उत्तर देते हुए जीवन के सूत्र समझाए थे।ये उपदेश श्रीमद्भागव गीता में मिलते	
TSO 2a तकनीकी कौशल एवं व्यव्हार कौशल में अन्तर बता पाएँगे . TSO 2b व्यव्हार कौशल का म महत्व स्पष्ट कर पाएँगे . TSO 2c आत्मा जागरूकता एवं आत्मा विश्लेषण का विवेचन सोदाहरण कर पाएँगे . TSO 2d भावनात्मक बुद्धिमत्ता एवं करुणा, अनुकूलनशीलता एवं लचीलापन का विकास कर पाएँगे. TSO 2e दैनिक जीवन में अनुकूलनशीलता एवं लचीलापन को आत्मसात कर पाएँगे .	**Unit-2.0: व्यावसायिकउत्कृष्टता हेतु व्यव्हार कौशल** 2.1 परिचय : तकनीकी कौशल एवं व्यवहार कौशल 2.2 व्यवहार कौशल का महत्त्व 2.3 जीवन कौशल : आत्म जागरूकता एवं आत्म विश्लेषण 2.4 वनात्मक बुद्धिमत्ता एवं करुणा, अनुकूलनशीलता एवं लचीलापन, व्यवहार कौशल का उपयोग श्रीराम केवट संवाद श्रीराम जब लक्ष्मण और सीता के साथ वन गमन के लिए प्रस्थान करते हैं तब सरयू नदी के पार उतारने लिए केवट से अनुरोध करते हैं।	**CO1**
TSO 3a पठित गद्यांश एवं पद्यांश से प्राप्त नयी शब्दावली विकसित कर पाएँगे TSO 3b दिए गये कहानियों, कविताओं एवं निबंधों का सारांश अपने शब्दों में लिख पाएँगे. TSO 3c दिए गये कहानियों, कविताओं एवं निबंधों में प्रयुक्त मुहावरों एवं अलंकारों को बता पाएँगे . TSO 3d कविताओं का भावार्थ स्पष्ट कर पाएँगे .	**Unit-3.0: पाठ-बोध : शब्दावली परिवर्धन एवं व्याकरण अभ्यास** 3.1 नमक का दरोगा, ईदगाह – मुंशी प्रेमचंद 3.2 बात (निबंध)- प्रताप नारायण मिश्र 3.3 वह प्रदीप जो दिख रहा है झिलमिल दूर नहीं है – रामधारी सिंह दिनकर 3.4 नर हो न निराश करो मन को – मैथिलीशरण गुप्त 3.5 कबीर के दोहे -काल्ह करे सो आज कर , जाति न पूछो साधू की , ऐसी वाणी बोलिए	**CO4**
TSO 4a अपनी शाखा से सम्बन्धित तकनीकी शब्दावली का चयन कर पाएँगे . TSO 4b पर्यायवाची एवं विलोम शब्दों से सम्बंधित शब्दावली तैयार कर सकेंगे . TSO 4c दिये गये गद्यांशों में विराम चिह्नों का सही प्रयोग कर पाएँगे .	**Unit-4.0: शब्दावली एवं व्याकरण** 2 Hrs 4.1 सामान्य शब्दावली 4.2 प्रशासनिक शब्दावली 4.3 शब्द भेद, अनेक शब्दों के लिए एक शब्द 4.4 विराम चिन्ह 4.5 मुहावरें एवं कहावतें	**CO4** **CO5**
TSO 5a दिए गये दिए गये गद्यांशों का संक्षेपण कर पाएँगे . TSO 5b विभिन्न प्रकार के पत्रों, आवेदनों ,सूचनाओं, विज्ञप्तियों को लिख पाएँगे . TSO 5c अपनी शाखा से सम्बंधित प्रतिवेदन लेखन कर पाएँगे . TSO 5d अपने संस्थान में हुए आयोजनों का प्रतिवेदन लिख पाएँगे.	**Unit-5.0: लेखन कौशल** 5.1 सार- लेखन 5.2 औपचारिक एवं व्यवसायिक पत्र लेखन 5.3 प्रारूप लेखन – सूचना, निविदा लेखन, प्रतिवेदन लेखन, बायोडाटा	**CO5**

Note: One major TSO may require more than one theory session/period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2400104 These practical's are common for both Part – A and Part -B.

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO1.a Identify the emotions of the speakers.	1	Emotions of the speakers.	CO1
LSO2.a Interpret instructions of audio transcripts.	2	Instructions of audio transcripts.	CO1
LSO3.a Solve the language puzzles based on the audio transcript.	3	Language puzzles.	CO1
LSO4.a Repeat words on language lab software after listening to them.	4	Repetition of words	CO1
LSO5.a Summarize the excerpt in their own words.	5	Summarize the excerpt.	CO1
LSO6.a Answer the questions based on the listening excerpt	6	Listening excerpt	CO2
LSO7.a Differentiate the sounds of minimal pairs, syllables, words, etc.	7	Sounds of minimal pairs, syllables words etc.	CO2
LSO8.a Pronounce the words/ sentences correctly based on the phonetic transcription.	8	Phonetic transcription.	CO2
LSO9.a Read out the words and sentences based on stress and intonation marks.	9	Stress and intonation.	CO2
LSO10.a Apply the paralanguage codes in verbal dialogues to show different emotions.	10	Paralanguage Codes	CO2
LSO11.a Integrate the non-verbal codes in their verbal dialogues.	11	Non-verbal Codes	CO2
LSO12.a Correct the verbal and non-verbal presentations of their peer while giving feedback.	12	Feedback on Presentations	CO2
LSO13.a Differentiate the sounds of minimal pairs, syllables, words, etc.	13	Syllables and Words	CO2
LSO14.a Locate the dictated words from the excerpt.	14	Dictated words	CO3
LSO15.a Arrange the correct and logical sequence of the jumbled sentences.	15	Jumbled Sentences.	CO3
LSO16.a Read the given texts aloud with proper pauses and proper pronunciation.	16	Pronunciation.	CO3
LSO17.a Compare the point of view with their peers.	17	Point of view of Self and Peers	CO4
LSO18.a Identify the main ideas of the excerpt	18	Main ideas of the excerpt	CO4
LSO19.a Prepare a list of technical jargon and register specific to their program /industry.	19	Technical Jargons	CO5
LSO20.a Write the specifications of the machines/ equipment available in the workshops/labs.	20	Specifications of the machines/ equipment	CO5
LSO21.a Write a report on the projects of their respective branches.	21	Report on the Projects	CO5

L) Suggested Term Work and Self-Learning: S2400104 Some sample suggested assignments, micro-projects, and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

1. Visit your institute's library/ web search and enlist the books, journals, and magazines related to your respective branches to prepare a bibliography consisting of names of the authors, titles of the books, publication, and place of publication.
2. SWOT Analysis: Analyze yourself concerning your strengths and weaknesses, opportunities, and threats for your communication.
3. Interview an eminent personality and write a report on it.
4. Deliver a seminar for 10-12 minutes using PPT on the topic given.
5. Prepare your timetable for a week and prioritize your activities.
6. Visit any historical places/offices/farms/industries/development sites etc. near your city and prepare a report on it.
7. Prepare a video of effective professional communication after listening to Bhagwat Geeta's conversation between Arjun and Krishna in the war field (IKS).

b. Micro Projects:

i. Book review – students should read a book and then write their reviews about the book and present it in the class.
ii. Interview any successful person in your locality in context with his life journey, inspiration social contribution, role model, and keys to success.
iii. Prepare a register of technical jargon of the industry related to their specific branch.
iv. Prepare a presentation on environmental issues of their locality with their solution.
v. Listen to the dialogues of the conversation between Krishna and Arjun before the war for specific and effective Communication (IKS)

c. Other Activities:

1. Arrange a Blood Donation Camp in collaboration with a blood bank and prepare a communication plan for the same.
2. Organize a cleanliness campaign in your campus premises and nearby places and prepare hoardings, boards, collages, and posters for the same.
3. Organize a campaign on educational awareness in the nearby places and prepare an advertising campaign for the same.

d. Self- learning topics:

- Listen to different Conversations of Ramayana,(the Rama -Bharat conversation before going to Vanvaas) Mahabharata (Bheem and Arjun Conversation during War), and Bhagwat Geeta (discussions of Strategies before War) to develop effective communication Skills (IKS)
- Collect new words from daily newspapers.
- Observe negotiation skills in the nearby shops.
- Watch educational channels for improving English communication.

M) **Suggested Course Evaluation Matrix:** The course teacher has to decide and use the appropriate assessment strategy and its weightage in theory, laboratory, and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**. This matrix has been prepared considering both Part – A and Part -B.

COs (Includes in Part -A & B)	**Course Evaluation Matrix**						
	Theory Assessment (TA)**		**Term Work Assessment (TWA)**			**Lab Assessment (LA)#**	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	**End Theory Assessment (ETA)**	**Term Work & Self Learning Assessment**			**Progressive Lab Assessment (PLA)**	**End Laboratory Assessment (ELA)**
			Assignments	**Micro Projects**	**Other Activities***		
CO-1	15%	20%	15%	20%	-	20%	20%
CO-2	10%	15%	10%	20%	25%	10%	20%
CO-3	20%	25%	15%	20%	25%	15%	20%
CO-4	25%	20%	30%	20%	25%	15%	20%
CO-5	30%	20%	30%	20%	25%	40%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

*: Other Activities include self-learning, seminars, visits, surveys, product development, software development, etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) **Suggested Specification Table for End Semester Theory Assessment:** Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	**Total Classroom Instruction (Cl) Hours**	**Relevant COs Number (s)**	**Total Marks**	**ETA (Marks)**		
				Remember (R)	**Understanding (U)**	**Application & above (A)**
(Part - A) **Unit-1.0** Communication Theory and Practice	5	CO1, CO2	10	3	3	4
Unit- 2.0 Types of Communication	5	CO3	8	2	2	4
Unit-3.0 Reading Comprehension	8	CO4, CO5	12	3	3	6
Unit-4.0 Vocabulary and Grammar	7	CO4, CO5	10	3	3	4
Unit-5.0 Professional Writing	7	CO5	10	3	4	3
(Part-B) **Units-1.0:** सम्प्रेषण सिद्धान्त एवं व्यवहार	2	CO1, CO2	3	1	1	1
Unit-2.0: व्यावसायिक उत्कृष्टता हेतु व्यव्हार कौशल	2	CO3	3	1	1	1
Unit-3.0: पाठ-बोध :शब्दावली परिवर्धन, एवं व्याकरण अभ्यास	5	CO4, CO5	5	1	1	3

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant COs Number (s)	Total Marks	ETA (Marks)		
				Remember (R)	Unders tanding (U)	Application & above (A)
Unit-4.0: शब्दावली एवं व्याकरण	4	CO5	5	1	1	3
Unit-5.0: लेखन कौशल	3	CO5	4	2	1	1
Total	**48**	-	**70**	**20**	**20**	**30**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

S. No.	Laboratory Practical Titles	Relevant COs Number (s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1	Emotions of the Speakers.	CO1	30	60	10
2	Instructions of Audio Transcripts.	CO1	30	60	10
3	Language Puzzles.	CO1	30	60	10
4	Repetition of Words.	CO1	30	60	10
5	Summarize the Excerpts.	CO1	30	60	10
6	Listening Excerpts.	CO2	30	60	10
7	Sounds of minimal Pairs, Syllables and Words etc.	CO2	30	60	10
8	Phonetic Transcription.	CO2	30	60	10
9	Stress and Intonation.	CO2	30	60	10
10	Paralanguage Codes	CO2	30	60	10
11	Non-Verbal Codes	CO2	30	60	10
12	Verbal and Non-Verbal Presentations	CO2	30	60	10
13	Sounds of minimal pairs, syllables and words	CO2	30	60	10
14	Locate the Dictated Words	CO3	30	60	10
15	Jumbled Sentences.	CO3	30	60	10
16	Pronunciation.	CO3	30	60	10

S. No.	Laboratory Practical Titles	Relevant COs Number (s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
17	Compare the Point of view with their Peers.	CO4	30	60	10
18	Main Ideas of the Excerpt	CO4	30	60	10
19	Technical Jargons	CO5	30	60	10
20	Specifications of the machines/ equipment	CO5	30	60	10
21	Report on the Projects	CO5	30	60	10

Legend:

PRA*: Process Assessment

PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment, Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	High end computers	Intel® Core™ i5-9400 (6-Core, 9MB Cache, up to 4.1GHz with Intel® Turbo Boost Technology) RAM: 8GB DDR 4 HDD: 3.5" 1TB 7200RPM SATA Hard Drive OS: Windows 10 Pro 64bit OEM License Other ports: Gigabyte LAN card	1 to 21
2.	Language Lab software	Teacher console supporting audio-visual language lab	1 to 21
3.	Printer	LaserJet printer	1 to 21
4.	Head Phones with microphones	Logitech H111 wired on headphones	1 to 21
5.	Computer Furniture	Computer Desk, chair	1 to 21
6.	Smart Projector	Standard Specification	1 to 21

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Communication Skills in English (AICTE Prescribed Text Book)	Dr. Anjana Tiwari	Khanna and Khanna, New Delhi
2.	Business Communication	Dr. Nishith Rajaram Dubey, Anupam Singh	Publisher: Indra Publishing House, 2023 ISBN- 978-93-93577-69-6
3.	Communication Skills	Sanjay Kumar & Pushap Lata	Oxford University Press, India
4.	Employability Skills	Dr. Nishith Rajaram Dubey, Anupam Singh	Indra Publishing House, 2023 ISBN - 978-93-93577-68-9
5	Technical Communication for Engineers	Shalini Verma	S. Chand
6.	English Grammar	Raymond Murphy	S. Chand
7.	British English Grammar and Composition	Dr. Ashok Kumar Singh	Student's Friends
8.	A Textbook of English Phonetics	T. Balasubramanian	Macmillan Publishers
9.	Thesaurus of English Words and Phrases	Roget	Simon and Schuster
10	Better English Pronunciation	J. D. O'Connor	Cambridge: Cambridge University Press, 1980
11	An English Grammar: Comprehending Principles and Rules	Lindley Murray.	London: Wilson and Sons, 1908.
12	Effective Communication Skills	Kulbhushan Kumar	Khanna Publishing House, New Delhi (Revised Edition 2018)
13	Examine your English	Margaret M. Maison	Orient Longman: New Delhi, 1964
14	Collin's English Dictionary	Harper Collins	Harper Collins, Glasgow
15	संप्रेषण कौशल	डॉ प्रवीण कुमार अग्रवाल , डॉ अवनीश कुमार मिश्रा	साहित्य भवन पब्लिकेशन : आगरा
16	आधुनिक हिंदी व्याकरण और रचना	डॉ वासुदेवनंदन प्रसाद	भारती भवन पब्लिकेशन

(b) Online Educational Resources:d

1. https://www.academia.edu/37871134/COMMUNICATION_SKILLS_1ST_YR_2_pdf
2. https://socialsci.libretexts.org/Courses/Butte_College/Exploring_Intercultural_Communication_(Grothe)/05%3A_Nonverbal_Processes_in_Intercultural_Communication/5.02%3A_Types_of_Nonverbal_Communication
3. http://muhamadjaelani35.blogspot.com/2014/11/inquiry-letter-order-letter-complaint.html?m=1
4. https://www.slideshare.net/sundaredu/barriers-of-communication-53545680
5. https://allpoetry.com/where-the-mind-is-without-fear
6. https://www.poetryfoundation.org/poems/46561/ode-on-solitude

7. https://www.poetryfoundation.org/poems/44644/a-psalm-of-life
8. https://www.poetryfoundation.org/poems/42891/stopping-by-woods-on-a-snowy-evening
9. https://www.hindisamay.com/content/
10. http://kavitakosh.org/
11. https://bundelkhand.in/maithilisharan-gupt/nar-ho-na-nirash-karo-man-ko
12. https://etc.usf.edu/lit2go/92/up-from-slavery/1575/chapter-3-the-struggle-for-an-education/
13. https://oursmartstudy.com/english-chapter-1-class-12-pdf-download/
14. https://ve-iitg.vlabs.ac.in/Listening%20Skills(Procedure).html
15. https://nptel.ac.in/courses/109104031

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. https://nptel.ac.in/courses/

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A) Course Code : 2400105B(T2400105B/S2400105B)

B) Course Title : Applied Mathematics- B (CSE, AIML)

C) Prerequisite Course(s) : Basic Engineering Mathematics

D) Rationale :

This course provides a strong foundation in mathematical principles and problem-solving skills essential in Computer science engineering and allied programs. A strong foundation in applied mathematics facilitates a deeper understanding of advanced engineering concepts and fosters interdisciplinary connections. Computational skills are valuable in engineering disciplines that heavily rely on computer simulations, data analysis, and modeling. Integral calculus is a fundamental tool to deal with a wide range of fields, especially problems related to engineering applications. Numerical methods provide a way to solve problems quickly and easily compared to analytic solutions. Number theory concepts like modular arithmetic are essential for cryptography and data encryption. Linear algebra is used in computer graphics, circuit analysis, robotics, and control systems. Linear programming techniques are applied to optimization problems in operations research, supply chain management, and resource allocation. By incorporating these topics, students comprehend to approach engineering problems from a mathematical perspective, enabling them to devise efficient and effective solutions and this leads to preparing Diploma graduates well-rounded, adaptable, and capable of making significant contributions to the branch-specific problems.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of the following course outcomes by the learners. For this, the learners are expected to performvarious activities related to three learning domains (Cognitive, Psychomotor, and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Demonstrate the ability to solve engineering-related problems based on applications of integration.

CO-2 Use the concept of number theory in problem-solving for cryptography and data compression.

CO-3 Perform computation for reaching solutions to nonlinear equations of branch-specific problems.

CO-4 Use linear algebra to solve branch-specific problems.

CO-5 Apply Linear programming for optimization problems.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Program Outcomes(POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	-	-	-	-	-	-		
CO-2	3	1	-	-	-	-	-		
CO-3	3	1	-	-	-	-	1		
CO-4	3	1	-	-	-	-	-		
CO-5	3	1	1	-	-	1	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by the respective program coordinator at the institute level. As per the latest NBA guidelines,

formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2400105B	Applied Mathematics - B	02	01	-	02	05	04

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400105B	Applied Mathematics - B	30	70	20	30	-	-	150

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW), and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to the attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020-related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS), and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400105B

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Use standard forms of integration to find the integral of given simple functions. TSO 1b. Apply suitable Trigonometric transformation to solve a given Integration problem. TSO 1c. Solve given problems using the properties of the definite integral. TSO 1d. Invoke the concept of Integration to solve the problems based on the area and volume of irregular shapes.	**Unit-1.0 Integral Calculus and its Applications** 1.1 Concept of Integration. 1.2 Working rules and Integral of standard Functions. 1.3 Method of Substitution, Trigonometric transformation, Integration by parts and Partial fraction. 1.4 Applications: Area and volume.	**CO1**
TSO 2a. Express GCD of two numbers a,b into linear form ax+by TSO 2b. Find the solution of linear congruences. TSO 2c. Solve the system of congruences using the Chinese remainder theorem.	**Unit-2.0 Number Theory** 2.1 Euclid's division algorithm, GCD, LCM. 2.2 Prime numbers and Fundamental theorem of Arithmetic. 2.3 Congruences and Modular Arithmetic. 2.4 Chinese Remainder Theorem.	**CO2**
TSO 3a. Find the root of the given equation using Iterative methods up to the desired accuracy. TSO 3b. Calculate the root of given equations using the Newton-Raphson Method. TSO 3c. Apply the Newton-Raphson Method for engineering applications. TSO 3d. Solve problems using the Bakhshali iterative method for finding approximate square root. (IKS).	**Unit-3.0 Numerical Solution of Nonlinear Equations** 3.1 Algebraic and Transcendental equations. 3.2 Iterative Methods. 3.3 Newton-Raphson Method. 3.4 siterative method for finding the approximate square root. (IKS)	**CO3**
TSO 4a. Compute the rank of a Matrix. TSO 4b. Apply the Cayley-Hamilton theorem to find the Inverse of a Matrix. TSO 4c. Determine the Eigen values and Eigen vectors of a Matrix. TSO 4d. Differentiate between Linearly Independent and Dependent Vectors.	**Unit-4.0 Linear Algebra** 4.1 Rank of a Matrix. 4.2 Cayley-Hamilton Theorem. 4.3 Eigen values and Eigen vectors of a Matrix. 4.4 Linearly Independent and Dependent Vectors.	**CO4**
TSO 5a. Formulate given word problems into LPP. TSO 5b. Solve LPP by Graphical method. TSO 5c. Use the Simplex method to obtain the optimal value of a given LPP.	**Unit-5.0 Linear Programming** 5.1 Mathematical formulation of LPP. 5.2 Graphical method of solving LPP. 5.3 Simplex Method	**CO5**

K) Suggested Tutorials and Outcomes:

Outcomes	S. No.	Tutorials Titles	Relevant COs Number(s)
1.1 Calculate the area of the hexagon using integration. 1.2 Calculate the average temperature of a city over a certain period.	1.	• Area of irregular shape using integration. • Average value of a function using integration • Analysis of the performance of a diode	CO1

Outcomes	S. No.	Tutorials Titles	Relevant COs Number(s)
1.3 Measure the current-voltage characteristics of a semiconductor diode using integration. 1.4 Determine the total power consumed by an electrical device using Integration techniques. 1.5 Apply the concept of definite integration to find the volume.		through integration. • Calculation of power consumption using integration. • Volume of an irregular shape using integration.	
2.1 Use open-source software to generate random numbers with the help of modular arithmetic 2.2 Use Open-source software to solve combined modular equations. 2.3 Use the Fundamental Theorem of Arithmetic to check the divisibility of given numbers	2.	• Modular Arithmetic • Linear Congruences • Fundamental Theorem of Arithmetic	CO2
3.1 Use Newton's method to find the roots of a non-linear equation in one variable. 3.2 Use the concept of Newton's method to solve financial modeling-related problems based on the Black-Scholes model. 3.3 Calculate the electric field (that satisfies Maxwell's equations) around a wire with a given shape and current, using Newton Raphson's method. 3.4 Solve problems using the Bakhshali iterative method for finding approximate square roots. (IKS)	3.	• Applications of iterative techniques. • Application of Newton Raphson's method. • Iterative scheme using Newton's method. • Bakhshali iterative methods for finding the approximate value of square root. (IKS)	CO3
4.1 Use Matrix as a tool to code and decode given messages. 4.2 Use open source software to determine eigenvalues and Eigenvector of a given Matrix 4.3 Demonstrate Linearly independent and dependent vectors on GeoGebra	4.	• Coding and Decoding of messages using Matrix. • Eigen values and Eigen vectors using open-source software. • Linearly Independent and Dependent Vectors.	CO4
5.1 Model Industry based problems into an LPP problem 5.2 Use open-source software to solve an LPP problem by the Simplex method	5.	• Linear Programming Model. • Simplex Method.	CO5

L) **Suggested Term Work and Self-Learning: S2400105B** Some sample suggested assignments, micro-projects, and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in linewith the targeted COs.

1. Find the area of the region enclosed between two curves, also verify the obtained result geometrically using any open source software.
2. Evaluate the Integral functions using open-source software and plot the Graph.
3. Prepare a write-up on the relevance of prime factorization in cryptography, integer factorization, and secure key generation.

4. Use modular arithmetic for random number generation within a specific range using open-source software.
5. Write down a program to compute the root transcendental equation by Newton Raphson Method.
6. Write down a program to compute the root of non-linear equations by Iterative method.
7. Prepare a presentation on the application of the Cayley-Hamilton theorem in graph theory to study properties of graphs, such as counting walks, cycles, or paths.
8. Prepare a presentation on applications of eigenvalues and eigenvectors used in Machine Learning algorithms. Explain their applications in dimensionality reduction, feature extraction, or classification tasks.
9. Formulate a network flow optimization problem, such as finding the maximum flow or minimum cost flow in a network, as a linear programming problem. Apply the Simplex method to find the optimal solution.
10. Explain how linear programming is used in support vector machines (SVMs) for classification and regression tasks. Discuss the formulation of linear programming problems in SVM optimization.

b. Micro Projects:

1. Prepare charts displaying various standard integration formulas.
2. Explore the use of Integral calculus to calculate the velocity and acceleration of a particle.
3. Prepare charts showing the area and volume of various geometrical shapes using Integral calculus.
4. Make a short video of duration 5-7 minutes for the use of modular Arithmetic in Data compression.
5. Write a Blog about the Fundamental Theorem of Arithmetic.
6. Prepare a comparative chart showing the convergence of various iterative techniques.
7. Prepare a chart consisting of 8-10 nonlinear equations made of real-world problems.
8. Download 5-7 videos based on applications of Linear Algebra in the field of Data Science, watch them, and write a report to detail the mathematical steps involved.
9. Make a short video of a duration of 5-7 minutes for the use of Linear Algebra in Single Value Decomposition (SVD).
10. Download 5-7 videos based on applications of LPP in the field of Deep Learning, watch them, and write a report to detail the mathematical steps involved.
11. Prepare the LPP model to solve Industry based optimization problems.

c. Other Activities:

1. Seminar Topics:
   - Applications of Integral calculus in control systems, dynamics, and vibrations.
   - Applications of Integral calculus in production and cost analysis.
   - Applications of Integral calculus in algorithms and optimization.
   - Applications of Integral calculus in population dynamics and bio-mathematics.
   - Applications of Integral calculus in filtering and feature extraction.
   - Application of number theory in data compression
   - Application of number theory in Cryptography
   - Application of number theory in the study of musical scales
   - Applications of Numerical Methods for Computer science engineering and allied programs.

- Numerical Solution of Nonlinear Equations using Root-Finding Algorithms: Techniques and Applications.
- Linear Algebra and Machine Learning.
- Linear Algebra behind Search Engines.
- Linear Algebra and its application in Data Science.
- Optimization techniques and their applications in Deep Learning.
- Linear Programming in Industry.

2. Visits: Visiting the following places would provide students an opportunity to see the application of various branches of mathematics in different fields. This will also help students to comprehend the career opportunities available in the field of mathematics.
   - Visit a mathematics research institute.
   - Visit to a Planetarium.
   - Visit to a Data Science Center.
   - Visit the mathematics department of a college or university.
   - Visit to a software company.
   - Visit a Gaming Studio.
3. Self- learning topics:
   - Integration Techniques and Applications.
   - Participate in MOOCs on Ordinary Differential Equations: Methods and Applications.
   - Participate in MOOCs on Modular Mathematics: Methods and Applications.
   - Watching videos on Linear algebra and Machine learning: Concepts and Applications.
   - Watching videos on Linear Programming and its applications to Data Science.

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use the appropriate assessment strategy and its weightage in theory, laboratory, and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self-Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	15%	15%	15%	20%	10%	-	-
CO-2	20%	20%	20%	20%	20%	-	-
CO-3	15%	15%	15%	20%	20%	-	-
CO-4	25%	25%	25%	20%	25%	-	-
CO-5	25%	25%	25%	20%	25%	-	-
Total Marks	**30**	**70**	**20**	**20**	**10**	**-**	**-**
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: The specification table represents the reflection of sample representation of the assessment of the cognitive domain of the full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Integral Calculus and its Applications	8	CO1	10	2	4	4
Unit-2.0 Number Theory	12	CO2	14	4	6	4
Unit-3.0 Numerical Solution of Nonlinear Equations	6	CO3	12	4	4	4
Unit-4.0 Linear Algebra	12	CO4	19	5	8	6
Unit-5.0 Linear Programming	10	CO5	15	5	6	4
Total	**48**	**-**	**70**	**20**	**28**	**22**

Note: A similar table can also be used to design class/mid-term/ internal question papers for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical): (Not Applicable)

P) Suggested Instructional/Implementation Strategies: Different Instructional/ ImplementationStrategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lectures, Tutorial, Case Methods, Group Discussions, Industrial visits, Industrial Training, Portfolio Learning, Role Play, Live Demonstrations in Classrooms, Labs, Field, Information and Communications Technology (ICT) Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Sessions, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment,Tools and Software	Broad Specifications	Relevant Experiment/Practical Number
1.	High-end computers	Processor Intel Core i7 with Compilers and Programming Languages, RAM 32 GB, DDR3/DDR4, HDD 500 GB, OS Windows 10.	All
2.	Software	Scientific Calculators, Graphing Calculator, SCILAB, GraphEq^2.13, Microsoft Mathematics, GeoGebra, Math3D	1,2,3,4,5
3.	Printer	High-Speed Duplex Printer	4,5
4.	Scanner	Handheld 3D scanner, Accuracy up to 0.1 mm, Resolution upto 0.2 mm, Wireless technology with an inbuilt touch screen and battery, Extended field of view for capturing both large and small objects.	4,5

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Elementary Engineering Mathematics	B. S. Grewal	Khanna Publishers,15th Edition. ISBN: 978-81-7409-257-1
2.	Engineering Mathematics (Third edition)	Croft, Anthony	Pearson Education, New Delhi, 2014. ISBN 978-81-317-2605-1
4.	Calculus and Analytic Geometry	G. B. Thomas, R. L. Finney	Addison Wesley, 9th Edition, 1995. ISBN 978-8174906168
5.	Understanding Engineering Mathematics	John Bird	Routledge; First Edition ISBN 978-0415662840
6.	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publ., New Delhi,2014, ISBN: 978-0-470-45836-5
7.	Mathematics for Computer Scientists	Gareth J. Janacek and Mark L. Close	Book Boon 2008 ISBN: 9788776814267
8.	Studies in the History of Indian Mathematics	C. S. Seshadri	Hindustan Book Agency (India) P 19 Green Park Extension New Delhi. ISBN 978-93-80250-06-9
9.	Mathematics-I	Deepak Singh	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4
10.	Mathematics-II	Garima Singh	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3

(b) Online Educational Resources:

1. https://ocw.mit.edu/
2. https://tutorial.math.lamar.edu/
3. https://www.khanacademy.org/
4. https://www.feynmanlectures.caltech.edu/
5. https://www.wolframalpha.com/
6. https://www.dplot.com/
7. https://www.geogebra.org/
8. https://www.easycalculation.com/
9. https://www.scilab.org/
10. https://www.desmos.com/
11. https://nptel.ac.in/
12. https://swayam.gov.in/
13. https://ndl.iitkgp.ac.in/
14. https://parakh.aicte-india.org/
15. https://ekumbh.aicte-india.org/
16. https://learnengg.com/LE/Index
17. https://ncert.nic.in/textbook.php
18. https://nios.ac.in/online-course-material/sr-secondary-courses/mathematics-(311).aspx

Note: Teachers are requested to check the Creative Commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Online Mathematics Courses.
2. Mathematics Communities and Forums.
3. Mathematics Journals.
4. Mathematics Podcast.
5. Mathematics Tutorials.
6. Mathematics Quizzes.
7. Mathematics Animation.
8. Mathematics Simulations.
9. Mathematics Games.
10. Mathematics Puzzles.
11. Mathematics Brain Teasers.
12. Mathematics Apps.
13. Mathematics Blog.
14. Mathematics Challenges.

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A) Course Code : **2400107(T2400107)**

B) Course Title : Professional Ethics

(CE, CSE, ELX, ELX (R), FTS, ME, AIML, MIE, CHE, CRE, FPP, GT, EE, AE, CACDDM)

C) Pre- requisite Course(s) : General awareness about moral values and different workplaces

D) Rationale :

One of the programme outcomes of the diploma course incorporates ethical practices in application of appropriate technology in context of society, sustainability, environment. It is of great importance to distinguish between the terms values and ethics. Ethics are norms of behaviour that are set by authorities at workplace. The persons belonging to that workplace are expected to follow the norms. Ethical behaviour at workplace affects the person's relation to people, creates a positive impact on business processes and environment. It is very important that a person has not only understanding of ethical behavior but also the responsibility to set ethical practices in own area of work.

While values are personal preferences or choices, they may sometimes contradict with ethics at his workplace. The values of a person affect behavior and his decision making.

This course is meant to sensitize the student to ethics in profession and motivate them to demonstrate ethical behavior in day to day activities and be aware of ethics in profession.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

After completion of the course, the students will be able to-

CO-1 Demonstrate good values and ethics in the day to day activities and at workplace.

CO-2 Identify a set of values and ethics related to fair professional practice.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (Cos)	Programme Outcomes(Pos)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Developmentof Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	3	3	3	3	3	3	3		
CO-2	3	3	3	3	3	3	3		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by the respective program coordinator at the institute level. As per the latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)				
		Classroom Instruction (CI)		Notional Hours (TW/ Activities+ SL)	Total Hours (CI+TW/ Activities)	Total Credits (C)
		L	T			
2400107	Professional Ethics	01	-	-	01	01

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment(TA)		Term Work & Self Learning Assessment (TWA)		Lab Assessment(LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400107	Professional Ethics	25	-	-	-	-	-	25

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400107

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Define concepts-values and ethics and attitude, development of attitudes *TSO 1b.* Identify situations depicting values such as humanity, honesty, punctuality, respect, peace, empathy *TSO 1c.* Identify situations depicting ethics, healthy competition, integrity, truthfulness,	**Unit-1.0 Values and Ethics in Day to Day Life** 1.1. Values- Definition and examples, Ethics- definition and examples, Concept of attitude and development of attitude 1.2. Importance of values and ethics in day to day activities and at workplace- Ethical ways of communication, environmental considerations in engineering processes, Basic concept of Carbon footprint, ethics at workplace 1.3. Examples of situations depicting values- based decisions and ethical behavior in day to Day life	**CO1**
TSO 2a. Identify the relevance of profession to society and environment *TSO 2b.* Identify the need of values and ethics in profession related activities *TSO 2c.* Identify Ethical conflicts	**Unit-2.0 Values and Ethics in Profession** 2.1 Relevance of profession to society 2.2 ethical principles such as respecting others and ourselves, respecting the rights of others, keeping promises, avoiding unnecessary problems to others, avoiding cheating and dishonesty, showing gratitude towards others and encouraging them to work 2.3 Identification of activities and related ethical and unethical behavior for professional activities in their area of work 2.4 Examples of situations depicting values- based decisions and ethical behavior	**CO1, CO2**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Activities and Self-Learning: Reading books related to values and ethics/Epics/ Daily news and discussions in group

a. Assignments: Preparation for group discussion, panel discussion, role play, case study, seminar, skits

b. Micro Projects: Skits development and performance, poster making,

c. Activities: Role Play, Case studies, Debates, Group Discussion,

d. Suggested Seminar/ Debates on Topics such as:

i. charters of professions
ii. Importance of Values and ethics in identified profession
iii. Issues of ethical conflicts- Professional rivalry,
iv. Identified issues from Chanakya Neeti
v. Ethics in scriptures such as Kabir ke Dohe etc.
vi. Lessons on ethics from religious scriptures
vii. Issued based on Happenings reported in Daily news

L) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Case Method, Group Discussion, seminar, Role Play, Live Demonstrations in Classrooms, Lab, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

M) List of Major Laboratory Equipment, Tools and Software: (Not Applicable)

N) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Professional Ethics and Human Values	D. R. Kiran	McGraw-Hill Education Pvt. Ltd. 2007 ISBN: 9780070633872
2.	A Textbook On Professional Ethics And Human Values	Dr. R S Naagarazan	New Age International (P) Ltd., Publishers, 2017 ISBN: 9789386173768
3.	Ethics, Integrity and Aptitude – **Hindi** (Paperback) (एथिक्स, सत्यनिष्ठा एवं अभिवृत्ति)	P.D Sharma	Rawat Publications, 2019 ISBN: 978-8131609941
4	Chanakya - Niti (Sutra Sahit) (Hindi)	Chanakya	Maple Press. 2014 ISBN 978-9350335529

(b) Online Educational Resources:

1. Free Ethics & Compliance Toolkit - Ethics and Compliance Initiative (https://www.ethics.org/resources/free-toolkit
2. Free & open source tools for ethics practitioners (https://www.cityethics.org/harvard-lab)
3. Microsoft Word - KPTI XII - Indian Ethics 03-05-13 (https://cbseacademic.nic.in/web_material/doc/ktpi/30_KPTI%20XII%20-%20Indian%20Ethics_old.pdfcbseacademic.nic.in)
4. Knowledge Traditions & Practices of India (cbseacademic.nic.in) (ps://cbseacademic.nic.in/web_material/Circulars/2012/68_KTPI/Module_5.pdf)

(c) Others: -

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A) Course Code : **2400108(T2400108)**

B) Course Title : Essence of Indian Knowledge System and Tradition
(Common for all Programmes)

C) Pre- requisite Course(s) :

D) Rationale :

This course will survey the basic structure and operative dimensions of Indian knowledge system. With the new education policy-NEP 2020 focusing on Indian Knowledge Systems (IKS) and Traditions of India. This course introduces the learners to the rich and varied knowledge traditions of India from antiquity to the present. This also helps the learner to know and understand their own systems and traditions which are imperative for any real development and progress. Also, it helps the learner to think independently and originally adopting Indian frameworks and models for solving the problems related to world of work where the student is supposed to perform.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course out comes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/laboratory/workshop/field/ industry.

After completion of the course, the students will be able to-

CO-1 Identify the rich heritage and legacy residing in our Indian Knowledge systems.

CO-2 Correlate the technological & philosophical concepts of IKS with engineering domain specific problems and local problems for finding out possible solutions.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO-2**
CO-1	2	-	-	-	1	1	1		
CO-2	1	2	2	-	3	1	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by the respective program coordinator at the institute level. As per the latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2400108	Essence of Indian Knowledge System and Tradition	01	-	-	-	01	01

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture(L), Tutorial(T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits= (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work& Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2400108	Essence of Indian Knowledge System and Tradition	25	-	-	-	-	-	25

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2400108

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain the architecture of the Ancient Indian Knowledge Systems. *TSO 1b.* List the salient features of IKS. *TSO 1c.* Comprehend the given IKS model. *TSO 1d.* Identify the role and relevance of the given IKS model in contemporary society.	**Unit-1.0 Introduction to Indian Knowledge Systems** 1.1 Overview of IKS 1.2 Organization of IKS – चतुर्दश-विद्यास्थानं 1.3 Conception and Constitution of Knowledge in Indian Tradition 1.4 The Oral Tradition 1.5 Models and Strategies of IKS	**CO1**
TSO 2a. Enlist the importance of Veda, Vedanga, Visaya, Siksaka. *TSO 2b.* Describe the given IKS domain. *TSO 2c.* Identify elements of mentioned IKS domains that are relevant to Technical Education System. *TSO 2d.* Correlate the elements of mentioned IKS domains with given engineering domain.	**Unit-2.0 Overview of IKS Domains and Relevance in Current Technical Education System** 2.1 The Vedas as the basis of IKS 2.2 Overview of all the six Vedāṅgas 2.3 Relevance of following IKS domains in present Technical Education System: • Arthashastra (Indian economics and political systems) • Ganita and Jyamiti (Indian Mathematics, Astronomy and Geometry • Rasayana (Indian Chemical Sciences) • Ayurveda (Indian Biological Sciences / Diet & Nutrition) • Jyotish Vidya (Observational astronomy and calendar systems) • Prakriti Vidya (Indian system of Terrestrial/ Material Sciences/ Ecology and Atmospheric Sciences) • Vastu Vidya (Indian system of Aesthetics-Iconography and built-environment /Architecture) • Nyaya Shastra (Indian systems of Social Ethics, Logic and Law) • Shilpa and Natya Shastra (Indian Classical Arts: Performing and Fine Arts) • Sankhya and Yoga Darshna (Indian psychology, Yoga and consciousness studies) • Vrikshayurveda (Plant Science / Sustainable agriculture/food preservation methods)	**CO1, CO2**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: (Not Applicable)

L) Suggested Term Work and Self Learning: Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

1. Write a report on any IKS domain highlighting the correlation with one domain specific engineering course.

c. Other Activities:

1. Seminar Topics: discuss any one IKS domain in details a highlighting the eminent works in the area.
2. Visits:
   - Visit any nearby ancient temple and corelate the geomatical, Shilpa and Vaastu on IKS dimensions specified in each domain.
3. Self-Learning Topics:
   - Sustainable practices adopted in ancient India that can be applied for current engineering situations.

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	-	-	-	-	-	-	-
CO-2	100%	-	100%	100%	100%	-	-
Total Marks	25	-	5	10	10	-	-
			25				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: (Not Applicable)

O) Suggested AssessmentTable for Laboratory (Practical): (Not Applicable)

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software: (Not Applicable)

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Introduction to Indian Knowledge System: Concepts and Applications	Archak, K.B. (2012).	Kaveri Books, New Delhi
2.	Introduction to Indian Knowledge System: Concepts and Applications	Mahadevan, B. Bhat, Vinayak Rajat Nagendra Pavana R.N.	PHI, ISBN: 9789391818203
3.	Glimpse into Kautilya's Arthashastra	Ramachandrudu P. (2010)	Sanskrit Academy, Hyderabad
4.	"Introduction" in Studies in Epics and Purāṇas, (Eds.)	KM Munshi and N Chandrashekara Aiyer	Bhartiya Vidya Bhavan

(b) Online Educational Resources:

1. http://bhavana.org.in
2. www.academia.edu/23254393/Science_in_Ancient_India_-_an_educational_module
3. www.academia.edu/23305766/Technology_in_Ancient_India_-_Michel_Danino
4. www.hamsi.org.nz/http://insaindia.res.in/journals/ijhs.php
5. www.niscair.res.in/sciencecommunication/ResearchJournals/rejour/ijtk/ijtk0.asp
6. www-history.mcs.st-andrews.ac.uk/Indexes/Indians.html

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. Swami Harshananda. "A bird's eye view of vedas". R K Math. Bangalore.,http:// rkmathbangalore. org/Books/ABirdsEyeViewOfTheVedas.pdf.
2. Sanskrit Prosody, https://en.wikipedia.org/wiki/Sanskrit_prosody.
3. Vartak, P.V. (1995). "Veda and Jyotish," Part II, Chapter 2, in Issues in Veda and Astrology, H Pandya (Ed.), pp 65 – 73.
4. Sundaram, A.V. (1995). "Astrology: Its usefulness and Limitations in ModernTimes", Part II, Chapter 9, in Issues in Veda and Astrology, H Pandya (Ed.), pp 129 – 135.
5. Archak, K.B. (2012), "The Vedāṅga Literature", Chapter VIII in Essentials of Vedic Literature, Kaveri Books, New Delhi, pp 330 – 391.
6. Vasant Lad (1996), "Ayurveda: A Brief Introduction and Guide", (whole article).

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