A)	**Course Code**	**: 2418105(T2418105/P2418105/S2418105)**
B)	**Course Title**	: Fundamentals of IT and C Programming
		(ELX, ELX (R), AE, FCT, EE)
C)	**Pre- requisite Course(s)**	:
D)	**Rationale**	:

Information technology is a term that describes the entire range of information generation, storage, transmission, retrieval, and processing. Most organizations in the industry, business, non-profit organizations, and government departments now rely heavily on their information systems (IS) and information technology (IT). Thus, student must possess basic skills to use Information technology and Information systems.

Looking to the current IT practices in business it is also necessary for student to learn basic programming skills that includes building logic, develop algorithms and then write programs. The 'C' has been widely used as a general-purpose language to develop basic and advanced applications,
Hence this course is designed keeping in view the development of a basic understanding of programming skills in students with the help of the 'C' programing language. The course is designed to create a base to develop foundation skills in IT and programming languages.

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   Appraise computer systems and its applications for various educational, business, and industrial domain.
CO-2   Setup a small computer Network.
CO-3   Write 'C' Program to solve given arithmetic expression
CO-4   Develop 'C' program Using control structure
CO-5   Develop 'C' programs using arrays.
CO-6   Create functions in C programs for modular programming approach.

F)   **Suggested Course Articulation Matrix:**

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	2	2		
CO-2	1	1	1	2	-	-	1		
CO-3	1	2	1	1	-	-	-		
CO-4	1	3	2	1	-	-	-		
CO-5	1	3	2	1	-	-	-		
CO-6	1	2	2	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				
2418105	Fundamentals of IT and C Programming	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)	
2418105	Fundamentals of IT and C Programming	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: T2418105

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Describe the anatomy of the Computer System. TSO 1b. List the different Input and Output devices. TSO 1c. Identify the different types of memory in computer systems. TSO 1d. Explain communication process between different components of a computer. TSO 1e. Describe the functionalities of a computer system. TSO 1f. Use Internet digital Platforms	**Unit-1.0 Basics of Computer System** 1.1 Computer System and its Components. - Generation of Computer - Anatomy of Computer Systems - Input and output device - Motherboard - Peripherals - Backend and Front end of System Unit 1.2. Storage device in Computer System - Primary Storage - Secondary Storage 1.3. CPU Components - Register - Control Unit - ALU 1.4. Types of Bus - Address Bus - Data Bus - Control Bus 1.5 Search Engine - Introduction - Search Query - Applications of Internet Digital Platforms (BHIM, Digi-Locker, m-paravian, NPTEL etc.)	**CO-1**

TSO 2a. Compare various computer network topologies
TSO 2b. Differentiate types of networks.
TSO 2c. Compare internet and intranet
TSO 2d. Explain IP addressing system.
TSO 2e. Explain functions of Networking Devices.
	Unit 2.0 Basic Network Concepts
	
	2.1 Network Topologies
	   Bus, Mesh, Star, Ring, Hybrid
	2.2 Types of Computer Networks
	    LAN, WAN
	2.4 Internet & Intranet
	IP Addressing system and URL, Internet, Intranet, Comparison between Intranet & Internet
	2.3 DNS
	- Introduction, Need
	- Domain Names & its types
	2.5 Networking Devices (Types and use)
	Switch, Router, Gateway, Modem, Repeater, Wireless Access Point, NIC
		CO-2

TSO 3a. Write Algorithm to solve the given problem.
TSO 3b. Write simple 'C' program to solve the given arithmetic expressions
TSO 3c. Write a simple 'C' Program demonstrating the given data type conversion
TSO 3d. Write I/O Statements for the given data.
	Unit 3.0 Basics of 'C' Programming and control structures
	
	3.1 Fundamentals of algorithms: Notion of an algorithm. Pseudo-code conventions like assignment statements and basic control structures.
	3.2 Flowchart: Flowchart, Symbols of flowchart, Guidelines for preparing Flowchart
	3.3 Introduction to C:
	        General Structure of a 'C' program
	        Data Concepts: Character set, tokens,
		CO-3

Major Theory Session Outcomes (TSOs)		Units	Relevant COs Number(s)
TSO 3e.	Write a 'C' program using a decision-making structure for two-way branching to solve the given problem.	keywords, Identifiers, Variables, Constant, data types, C operators, Arithmetic operators, Arithmetic expression, declaring variables, and data type conversion.	
TSO 3f.	Write a 'C' program using a decision-making structure for multi-way branching to solve the given problem.	3.4 Basic Input output: Input and Output statements, using printf() and scanf(), character input/output statements, Input/output formatting, Use of comments	
TSO 3g.	Apply loop statements to solve the given iterative problem in 'C' program.	3.5 Decision making and branching: Relational and logical operators, if statement, if else statement, nested if-else, if-else ladder' The switch statement	
TSO 3h.	Use appropriate statements to change the program flow in the given loop.	3.6 Looping: While loop, Do… While loop For loop, Go to statement, Use of break and continue statements	
TSO 4a.	Write statements to read, write the given array.	**Unit 4.0 Array and Pointer**	**CO-4**
TSO 4b.	Manipulate the given array of characters and numbers.	4.1 Characteristics of an array, One dimension and two-dimension arrays, Array declaration and Initialization	
TSO 4c.	Use pointers to access memory locations for solving the given problem.	4.2 Array of characters, Operation on array Character and String input/output **Concepts of pointers: declaring, initializing, accessing.**	
TSO 5a.	Use the given Library function.	**Unit 5.0 Concept and Need of Functions**	**CO-5**
TSO 5b.	Develop user defined functions for the given problem.	Library functions: Math functions, String handling functions, other miscellaneous functions.	
TSO 5c.	Write 'C' codes to pass the given function parameters using "call by value" and "call by reference" approach.	Writing User defined functions, scope of variables. Parameter passing: call by value, call by reference. Recursive functions	
TSO 5d.	Write recursive function for the given problem.		

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

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2418105

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. install device driver. LSO 1.2. Install given software on your system. LSO 1.3. Perform Registration process of digital India platform.	1.	1.1 Identify specifications of various types of computer systems available in your institute. 1.2 Install Printer, scanner driver. 1.3 Install any two freeware or open-source software/tool by using web browser 1.4 Use Digital India Platforms: BHIM, Dig-Locker, m-parivahan, NPTEL.	CO-1
LSO 2.1. List various types of networking devices in your Institute. LSO 2.2. make a small local area network.	2.	2.1 Connect two/three computers to form a network using wire/wireless connectivity and configure it.	CO-2

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)

LSO 3.1. Write and execute simple 'C' program.
LSO 3.2. Use scanf() and printf() functions in 'C' programs.
LSO 3.3. Write C Program using Decision Making and two-way branching statements.
LSO 3.4. Write C Program using "switch-case" statement for multi-way branching.
LSO 3.5. Use the "if" and "Switch" statements appropriately for decision making in C Program.
LSO 3.6. Write and execute C programs using various types of loop statements to solve iterative problems.
	3.	3.1 Write 3 different C –Program to demonstrate use of Arithmetic expression, constant, variable and Increment/ decrement operators.
		3.2 Write a 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).
		3.3 Using switch statement-
		 Write program to:
		 Print day of week by taking number from 1 to 7.
		3.4 Write Program to:
		 a. Find sum of digits of a given number.
		 b. Find Fibonacci series for given number.
		 c. Write a program to produce the following output:
		
		         1
		      2 3
		    4 5 6
		  7 8 9 10
			CO-3, CO-4

LSO 4.1. Write and execute C programs using one-dimension array. *LSO 4.2.* Write and execute C program using two-dimensional array.	4	4.1 Develop a Program to: a. Sort list of 10 numbers. b. Perform addition of 3x3 matrix.	CO-5
LSO 5.1. Write C program using different types of library functions to solve given problem. *LSO 5.2.* Write C program to Create and use user defined functions	5.	5.1 Develop Program to demonstrate: a. Use of String handling functions. b. Use of Mathematical functions. c. Use of other miscellaneous functions. 5.2 Develop a Program to: a. Create a function to find GCD of given number. Call this function in a program. 5.3 Find Factorial of given number using recursion.	CO-6

L)   **Suggested Term Work and Self Learning: S2418105** 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. Identify specifications of various types of computer systems in your Institute .
   2. Prepare a report on computer peripherals and its usage of your computer lab.
   3. Prepare a presentation on network topology.
   4. Prepare a survey report to identify various types of networking devices available in your Institute.
   5. Make a calculator using 'C' programming.

c. **Other Activities:**
   1. Seminar Topics: -
      - "Future of IT"
      - "Scope of 'C' programming in other Engineering disciplines"
   2. Prepare a poster presentation on Computer hardware and peripherals.
   3. Prepare a report on Open Source software available for Electronics Engineering.
   4. Product Development: Development of projects for real life problem solution using 'C' programming.

d. Self-Learning Topics:
   1. System and application software.
   2. Scope of 'C' programming in real world.

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	10%	10%	10%			10%	-
CO-2	10%	10%	10%			10%	-
CO-3	10%	10%	15%	100%	100%	25%	**30%**
CO-4	25%	25%	25%			25%	**40%**
CO-5	25%	25%	20%			15%	**30%**
CO-6	20%	20%	20%			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 (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Basics of Information System	5	CO-1	7	3	3	1
Unit 2.0 Basic Network Concepts	5	CO-2	7	3	2	2
Unit 3.0 Basics of 'C' Programming and control structures	18	CO-3 and CO-4	28	8	8	12
Unit 4.0 Array and Pointer	12	CO-5	17	3	4	10
Unit 5.0 Concept and need of functions	8	CO-6	11	3	2	6
Total	**48**	**-**	**70**	**20**	**19**	**31**

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		Viva-Voce (%)
			Performance		
			PRA* (%)	PDA** (%)	
1.	Identify specifications of various types of computer systems available in your institute.	CO-1	40	50	10
2.	Install Printer driver.	CO-1	40	50	10
3.	Install any two freeware or open-source software/tool by using web browser	CO-1	40	50	10
4.	Use Digital India Platforms: BHIM, Dig-Locker, m-parivahan, NPTEL.	CO-1	30	60	10
5.	Connect two/three computers to form a network using wire/wireless connectivity and configure it.	CO-2	40	50	10
6.	Write 3 different C –Program to demonstrate Arithmetic expression, constant, variable and Increment/decrement operator.	CO-3	50	40	10
7.	Write a 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 a vowel (use if-else ladder).	CO-3	50	40	10
8.	Write program to: Print day of week by taking number from 1 to 7.	CO-3	50	40	10
9.	Write Program to: (a) Find sum of digits of a given number. (b) Find Fibonacci series for given number. (c) Write a program to produce the following output:	CO-3	50	40	10

S. No.	Laboratory Practical Titles	Relevant COs Number(s)	PLA /ELA Performance PRA* (%)	PLA /ELA Performance PDA** (%)	Viva-Voce (%)
	1 2 3 4 5 6 7 8 9 10				
10.	Develop a Program to: a. Sort list of 10 numbers. b. Perform addition of 3x3 matrix.	CO-4	50	40	10
11.	Develop Program to demonstrate: a. Use of all String handling functions. b. Use of few Mathematical functions. c. Use of few other miscellaneous functions.	CO-5	50	40	10
12.	Develop a Program to: a. Create a function to find GCD of given number. Call this function in a program	CO-5	50	40	10
13.	Find Factorial of given number using recursion.	CO-5	50	40	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 (No Generic) Give basic configuration or Latest	Relevant Experiment/Practical Number
1	Computer System	Any General-purpose Computer	All
5	Switch	4, 8, 12, 16 or 24 port switches with 100/1000 gbps data transfer speed	5
6	Ethernet cable	Cat 6, cat6e or above	5
8	Printer	Any printer dot matrix, inkjet or laser printer	2
9	C complier	Turbo C/ Dev C/Others	6-13

R)   Suggested Learning Resources:

(a)   Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1	Computer fundamentals and programming in C	Reema thareja	Oxford university press INDIA ISBN-10 : 9780199463732 ISBN-13 : 978-0199463732
2	Let us C	Yashavant Kanetkar	BPB publication, ISBN-10 : 8183331637 ISBN-13 : 978-8183331630
3	Programming in ANSI C	E. Balagurusamy	McGraw Hill education ISBN-10 : 935316513X ISBN-13 : 978-9351343202
4	Computer Fundamentals Concepts Systems and Applications 8th Edition (English, Paperback,	Priti Sinha, Pradeep Sinha	BPB Publications ISBN-13: 9788176567527 ISBN-10: 8176567523
5	Fundamentals of Computers	E Balagurusamy	McGraw Hill Education 2009, ISBN-10 : 9780070141605 ISBN-13 : 978-0070141605

(b)   Open Educational Resources:

1.   https://nptel.ac.in/courses/106104128
2.   https://en.wikipedia.org/wiki/Networking_hardware
3.   https://www.javatpoint.com/computer-fundamentals-tutorial
4.   https://www.w3schools.com/c/

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.   Learning Header files
2.   Lab Manuals

******