## Course Handout

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| Institute/School Name | Chitkara University Institute of Engineering and Technology | | |
| Department Name | Department of Computer Science & Engineering | | |
| Programme Name | Bachelor of Engineering (B.E.), Computer Science & Engineering | | |
| Course Name | Fundamentals of C Programming | Session | Jan 2025- Jun-2025 |
| Course Code | 24CSE0104 | Semester/Batch | 2nd/ 2024 |
| L-T-P(Per Week) | 2-0-4 | Course Credits | 4 |
| Pre-requisite | N/A | NHEQF Level | 4.5 |
| Course Coordinator | Dr. Gaganpreet Kaur | SDG Number | 4, 9 |

1. **Objectives of the Course**

C programming is a powerful, general-purpose, high-performance programming language. It is a compiled, statically-typed language known for its efficiency and close interaction with hardware. C is widely used in system programming, embedded systems, and application development. Its portability allows code to run on various platforms, making it a preferred choice for building operating systems and other performance-critical applications. This course provides a wide scope of learning & understanding of C programming. The main objectives of the course are:

* + - To impart knowledge about the different problem solving aspects including general problem solving strategies and working backwards from solution.
    - To expose students to the concepts like variables, identifiers, data types, basic input/output, operators etc. for C-Language
    - To provide skills to use different control statement (sequential, conditional and iterative), the concepts of pointers and functions for logic building.
    - To enable learners to assess the lifecycles of different identifiers by providing the knowledge about different storage structures and array implementations.
    - To create efficient programming solutions in common engineering design situations.

## Course Learning Outcomes (CLOs)

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|  | **CLOs** | **Program Outcomes (PO)** | **NHEQF Level Descriptor** | **No. of Lectures** |
| **CLO01** | Understand C-Language features and basics of problem solving aspects for logic building. | PO1, PO2, PO3, PO5, PO12 | Q1, Q3, Q6 |  |
| **CLO02** | Use of variables, data types, identifiers, different operators and expressions | PO1, PO3, PO4, PO5 | Q1, Q2 |  |
| **CLO03** | Apply conditional statements, switch case statements and iterative statements as flow controls in C-Language to solve complex problems. | PO1, PO2, PO3, PO4, PO5, PO7, PO11 | Q3, Q6 |  |
| **CLO04** | Implement functions, recursion to solve complex problems and observe the use of storage classes in C-language. | PO3, PO4, PO5, P12 | Q3 |  |
| **CLO05** | Use pointers and one/two dimensional arrays to store and retreive data items in C-language. | PO4, PO5 | Q1, Q2 |  |
| **CLO06**  (Only for lab component) | Develop real-world applications using the C Programming concepts. | PO1, PO2, PO3, PO4, PO5, PO7, PO11, P12 | Q3, Q6 |  |
| **Total Contact Hours** | | | |  |

## CLO-PO Mapping

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CLO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **Type of Assessment’s** |
| CLO01 | H | M | M |  | H |  |  |  |  |  |  | M | Formative,Summative |
| CLO02 | M |  | M | H | M |  |  |  |  |  |  |  | Formative,Summative |
| CLO03 | L | M | H | M | M |  | L |  |  |  | L |  | Formative,Summative |
| CLO04 |  |  | L | M | H |  |  |  |  |  |  | M | Formative,Summative |
| CLO05 |  |  |  | L | H |  |  |  |  |  |  |  | Formative,Summative |
| CLO06 | L | M | H | M | M |  | L |  |  |  | H | M | Formative |

H=High, M=Medium, L=Low

## Recommended Books:

**B01:** Kanetkar, Yashwant, "Let us C", New Delhi BPB Publication 2019. 17th Edition.

## B02: E. Balagurusamy,"Programming in ANSI C", McGraw Hill Education India, 2019, Edition-8

**B03:** Reema Thareja, " Computer Fundamentals and Programming in C", Oxford University Press, 2016, 2nd Edition

## B04: Schildt, Herbert, "C: The Complete Reference", McGraw Hill Education (New Delhi), 2018, 4th Edition

**B05:** Kernighan,Brian W.and Ritchie,Dennis M, "The C Programming Language", Pearson Education (New Delhi), 2007, 2nd Edition

## B06: E. Balagurusamy,"Fundamentals of Computers", McGraw Hill Education India, 2011, Edition-6

## Other readings and relevant websites:

|  |  |
| --- | --- |
| **Serial No** | **Link of Journals, Magazines, websites and Research Papers** |
| **1.** | <https://nptel.ac.in/courses/106106210> |
| **2.** | https://[www.coursera.org/specializations/c-programming](http://www.coursera.org/specializations/c-programming) |
| **3.** | https://[www.coursera.org/learn/c-for-everyone](http://www.coursera.org/learn/c-for-everyone) |
| **4.** | <https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/> |
| **5.** | <https://ocw.mit.edu/courses/6-s096-introduction-to-c-and-c-january-iap-2013/> |
| **6.** | <https://catalogue.library.cern/literature/t50vw-6at59> |

1 National Higher Education Qualification Framework Level, Refer to annexure

2 NHEQF Level Descriptor, Refer to Annexure & [Learning outcomes descriptors for qualification for all levels on the NHEQF](https://drive.google.com/file/d/120XvcaaQvU-6gr1CTCACV58wUc_KM6AH/view?usp=drive_link)

3Types of Assessments can be referred from Type of Assessments. Refer to Annexure.

4For SDG Mapping with Courses, Pl refer [SDG Mapping policy for Courses](https://docs.google.com/document/d/1DwvbByb8VAeBVEy8VTlCXn-xKIf3KUDmTKluEFC1mHQ/edit?usp=sharing)

## Recommended Tools and Platforms

Code Blocks, GCC Compiler

## Course Plan: Theory+ Lab Plan Theory Plan

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| --- | --- |
| **Lect. No.** | **Topic(s)** |
| 1-4 | **The Problem Solving Aspect:** Problem definition phase, Getting started on a problem, The use of specific examples Similarities among problems, General Problem solving strategies. |
| 5-8 | **Introduction to programming in C:** First Program in C, Variables and Identifiers, Data types, Basic Input Output in C: Characters, Basic Input Output in C: Formatted IO |
| 9-10 | **Operators in C:**Arithmetic Operators, Relational and Logical Operators, More Operators, Precedence and Associativity of operators |
| 11-15 | **Conditional Statements:** If statement, if-else statement, if statement mistakes, nested if statements  Conditional Operator, Switch statement |
| 16-18 | **Loops in C:** While loop, Looping - For loop, Control with break and continue, Variants of for loop |
| 19-20 | **More on Loops:** Nested for loops , Printing patterns with loops, do-while loop |
| 21-22 | **Introduction to recursion:** Recursion basic programs like: factorial, Fibonacci, sum of digits |
| 23-25 | **Functions in C:** Definition and declaration of a function, Scope of a function |
| 26-27 | **Storage Classes in C:** Auto storage class, extern storage class, static storage class, register storage class |
| 28-30 | **Pointer in C**: Introduction to Pointers in C, Parameter passing techniques, Pointer Arithmetic in C, Pointer Arithmetic with Pointers |
| 31-33 | **Array in C:** Arrays, Searching an Element, Arrays and Memory in C |
| 34-38 | **Array & Pointer:** Pointers with Arrays, Functions and Arrays, 2D Arrays, Understand memory allocation using memory management functions. |
| 39-40 | **Strings in C**: Declaring and Initializing String Variables, Reading and Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions, Example Programs (with and without using built-in string functions) |
| 41-45 | **Structures in C:**Introduction**,** Defining a structure**,** Declaring structure variables**,** Accessing structure members**,** Structure initialization**,** Array of structures**,** Array within structure |

**Lab Plan**

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| --- | --- |
| **Lab No.** | **Topic(s)** |
| **1-2** | Install C compiler (GCC/Code::Blocks), set up IDE, compile and run the first "Hello, World!" program, and understand the process of compiling and debugging a C program |
| **3-4** | Work with variables, identifiers, and data types in C. Learn how to declare and initialize different types of variables (int, float, char). Practice using basic input and output functions (scanf, printf). |
| **5-6** | Practice formatted input/output in C: Focus on using various format specifiers with printf and scanf for different data types. Understand how to handle simple user inputs and outputs in real-world scenarios. |
| **7-8** | Understand and apply arithmetic, relational, and logical operators in C. Focus on using operators to manipulate data and make decisions based on conditions. Practice with different types of expressions and operator precedence. |
| **9-10** | Explore more operators in C, such as bitwise operators, increment/decrement operators. Focus on solving problems involving complex expressions, ensuring the proper use of operator precedence and associativity. |
| **11-12** | Work with conditional statements in C: if, else, else if. Solve problems that involve simple decision-making based on conditions, with multiple branches and nested conditions. |
| **13-14** | Use the conditional operator (?:) to write concise conditional expressions. Understand the syntax and when to use switch statements effectively. Explore real-world use cases like menu selection or simple decision trees. |
| **15-16** | Work with while, for, and do-while loops. Focus on using loops to repeat tasks and solve problems involving iterative calculations. |
| **17-18** | Focus on nested loops and use them to solve problems that involve multiple iterations or iterations within iterations (e.g., printing patterns). Practice controlling loop execution with break and continue. |
| **19-20** | Solve problems using do-while loops. Explore scenarios where a loop needs to execute at least once before checking a condition (e.g., menu-driven programs). |
| **21-22** | Explore recursion in C. Understand the concept of recursion and how to write recursive functions. Practice solving problems using recursion, and explore how recursion works with function calls and base cases. |
| **23-24** | Learn to define and call functions in C. Understand function parameters, return values, and scope. Practice using functions for modularizing code and organizing programs logically. Solve problems that require multiple function calls. |
| **25-26** | Understand and implement storage classes (auto, extern, static, register). Focus on how storage classes affect variable scope, lifetime, and visibility. Practice writing programs that demonstrate the use of different storage classes. |
| **27-28** | Understand the basics of pointers in C. Practice using pointers to reference variables, manipulate memory, and perform address-based operations. Focus on pointer initialization, dereferencing, and pointer arithmetic. |
| **29-30** | Learn to use pointers with arrays to access and manipulate array elements. Explore pointer arithmetic for array indexing and solving problems involving arrays and memory. |
| **31-32** | Implement functions that accept and return pointers. Focus on passing arrays to functions via pointers, modifying data using pointers, and understanding pointer-to-pointer operations. |
| **33-34** | Work with 2D arrays in C. Learn how to declare, initialize, and access 2D arrays. Practice manipulating 2D arrays using loops and implement problems that require working with matrices. |
| **35-36** | Understand memory allocation using memory management functions. Practice allocating and deallocating memory during runtime, and solve problems. |
| **37-40** | Learn to write example programs using strings in C, both with and without built-in string functions. Practice declaring and initializing string variables, reading strings, and performing operations like concatenation and comparison. Explore string-handling functions for efficiency and implement custom logic for tasks like reversing strings or counting characters. |
| **40-45** | Learn the fundamentals of structures in C, starting with their introduction and how to define a structure. Focus on declaring structure variables, accessing structure members, and initializing structures. Practice creating arrays of structures and explore advanced concepts like arrays within structures. Implement real-world examples to understand their applications in data organization. |

## Delivery/Instructional Resources Theory Plan:

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Lect. No.** | **Topics** | **CLO** | **Book No, CH No, Page No** | **TLM7** | **ALM8** | **Web References** | **Audio- Video** |
| 1-4 | The Problem Solving Aspect, Problem definition phase, Getting started on a problem, The use of specific examples Similarities among problems, General Problem solving strategies | CLO01 | B06, CH 13, Page no 332- 351 | Lecture | Quiz | <https://www.coursera.org/specializations/c-programming> | <https://archive.nptel.ac.in/courses/106/106/106106210/> |
| 5-8 | Introduction to programming in C, First Program in C | CLO01 | B01, CH 1, Page no 10-15 | Lecture | Test questions | <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| 6-8 | Variables and Identifiers, Data types, Basic Input Output in C - Characters, Basic Input Output in C - Formatted IO | CLO02 | B01, CH 1, Page no 6-12  B01, CH 11, Page no 351-362 | Lecture | Quiz, Brain storming sessions | <https://www.coursera.org/learn/c-for-everyone>  <https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/calendar/> | <https://archive.nptel.ac.in/courses/106/106/106106210/> |
| 9-10 | Arithmetic Operators, Relational and Logical Operators, More Operators, Precedence and Associativity of operators | CLO02 | B01, CH 2, Page no 21-32 | Lecture | Quiz, Test questions | <https://www.coursera.org/learn/c-for-everyone>  <https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/calendar/> | <https://archive.nptel.ac.in/courses/106/106/106106210/> |
| 11-13 | If statement, if-else statement, if statement mistakes, nested if statements | CLO03 | B01, CH 3, Page no 39-50 | Lecture | Peer review, quiz | <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/106/106106210/> |
| 14-15 | Conditional Operator, Switch statement | CLO03 | B01, CH 4, Page no 57-66  B01, CH 7, Page no 117-126 | Lecture | Quiz, Puzzles | <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/106/106106210/> |
| 16-18 | While loop, Looping - For loop, Control with break and continue, Variants of for loop | CLO03 | B01, CH 5, Page no 81-88  B01, CH 6, Page no 95-104 | Lecture | Brain storming sessions, Tests | <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/106/106106210/> |
| 19-20 | Nested for loops , Printing patterns with loops, do-while loop | CLO03 | B01, CH 6, Page no 102-107 | Lecture | Test questions, Quiz | <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/106/106106210/>  <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| 21-22 | Introduction to recursion, Recursion basic programs like: factorial, Fibonacci, sum of digits | CLO03 | B01, CH 10, Page no 173-181 | Lecture | Brain storming sessions, Peer review | <https://www.coursera.org/specializations/c-programming>  <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/106/106106210/>  <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| 23-25 | Functions in C, Definition and declaration of a function, Scope of a function | CLO04 | B01, CH 7, Page no 135-149 | Lecture | Test questions | <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/106/106106210/>  <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| 26-27 | Auto storage class, extern storage class, static storage class, register storage class | CLO04 | B01, CH 11, Page no 192-198 | Lecture | Puzzles, Test questions | <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| 28-30 | Introduction to Pointers in C, Parameter passing techniques, Pointer Arithmetic in C, Pointer Arithmetic with Pointers | CLO05 | B01, CH 9, Page no 157-167 | Lecture | Quiz, Brain storming sessions | <https://www.coursera.org/specializations/c-programming>  <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| 31-33 | Arrays, Searching an Element, Arrays and Memory in C | CLO05 | B01, CH 13, Page no 239-245 | Lecture | Test questions | <https://www.coursera.org/specializations/c-programming>  <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/106/106106210/>  <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| 34-37 | Pointers with Arrays, Functions and Arrays | CLO05 | B01, CH 13, Page no 247-255 | Lecture | Quiz, Test questions | <https://www.coursera.org/specializations/c-programming>  <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| 38 | 2D Arrays | CLO05 | B01, CH 14, Page no 267-274 | Lecture | Quiz | <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/106/106106210/> |
| 39-40 | Declaring and Initializing String Variables, Reading and Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions | CLO05 | B01, CH 15, Page no 296-310 | Lecture | Test questions | https://ocw.mit.edu/courses/  6-087-practical-  programming-in-c-january-  iap-2010/ | https://archive.nptel.ac.in/c  ours  es/106/105/106105171/Lecture-35 |
| 41-45 | Introduction**,** Defining a structure**,** Declaring structure variables**,** Accessing structure members**,** Structure initialization**,** Array of structures**,** Array within structure | CLO05 | B01, Ch. 16, Pg. 334-348 | Lecture | Test questions | https://ocw.mit.edu/courses/  6-087-practical-  programming-in-c-january-  iap-  2010/resources/mit6\_087ia  p10\_lec06/ | https://archive.nptel.ac.in/cour  ses/106/105/106105234/ |

**Lab Plan:**

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| --- | --- | --- | --- | --- | --- | --- |
| **Lab No.** | **Experiment** | **CLO** | **TLM7** | **ALM8** | **Web References** | **Audio-Video** |
| **1-2** | Install C compiler (GCC/Code:Blocks), set up IDE, compile and run the first "Hello, World!" program, and understand the process of compiling and debugging a C program. Introduction to basic problem-solving strategies. | CLO01 | Demonstration method using a simulation tool | Quiz, Group discussion | <https://www.geeksforgeeks.org/compiling-a-c-program-behind-the-scenes/> | <https://archive.nptel.ac.in/courses/106/106/106106210/> |
| **3-4** | Work with variables, identifiers, and data types in C. Learn how to declare and initialize different types of variables (int, float, char). Practice using basic input and output functions (scanf, printf). | CLO02 | Demonstration method using a simulation tool | Quiz, Group discussion | <https://unstop.com/blog/variables-in-c>  <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| **5-6** | Practice formatted input/output in C. Focus on using various format specifiers with printf and scanf for different data types. Understand how to handle simple user inputs and outputs in real-world scenarios. | CLO02 | Discussion | Quiz, Flowcharts, PPTs | <https://www.coursera.org/specializations/c-programming> | <https://nptel.ac.in/courses/106106210> |
| **7-8** | Understand and apply arithmetic, relational, and logical operators in C. Focus on using operators to manipulate data and make decisions based on conditions. Practice with different types of expressions and operator precedence. | CLO02 | Lecture | Test questions | <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| **9-10** | Explore more operators in C, such as bitwise operators, increment/decrement operators. Focus on solving problems involving complex expressions, ensuring the proper use of operator precedence and associativity. | CLO02 | Lecture | Test questions | <https://www.geeksforgeeks.org/operator-precedence-and-associativity-in-c/> | <https://nptel.ac.in/courses/106106210> |
| **11-12** | Work with conditional statements in C: if, else, else if. Solve problems that involve simple decision-making based on conditions, with multiple branches and nested conditions. | CLO03 | Demonstration method using a simulation tool | Quiz, Group discussion | <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| **13-14** | Use the conditional operator (?:) to write concise conditional expressions. Understand the syntax and when to use switch statements effectively. Explore real-world use cases like menu selection or simple decision trees. | CLO03 | Discussion | Quiz, PPTs | <https://www.geeksforgeeks.org/conditional-statements-in-programming/> | <https://nptel.ac.in/courses/106106210> |
| **15-16** | Work with while, for, and do-while loops. Focus on using loops to repeat tasks and solve problems involving iterative calculations. | CLO03 | Demonstration method using a simulation tool | Quiz, Group discussion | <https://www.coursera.org/learn/c-for-everyone>  <https://openclassrooms.com/en/courses/6902811-learn-python-basics/7090826-easily-repeat-tasks-using-loops> | <https://nptel.ac.in/courses/106106210> |
| **17-18** | Focus on nested loops and use them to solve problems that involve multiple iterations or iterations within iterations (e.g., printing patterns). Practice controlling loop execution with break and continue. | CLO03 | Lecture | Test questions | <https://www.coursera.org/learn/c-for-everyone>  <https://openclassrooms.com/en/courses/6902811-learn-python-basics/7090826-easily-repeat-tasks-using-loops> | <https://nptel.ac.in/courses/106106210> |
| **19-20** | Solve problems using do-while loops. Explore scenarios where a loop needs to execute at least once before checking a condition (e.g., menu-driven programs). | CLO03 | Demonstration method using a simulation tool | Quiz, Test questions | <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| **21-22** | Solve problems using recursion. Focus on recursive problem-solving techniques, such as breaking problems into smaller sub-problems. Understand how recursive calls work in the call stack and learn to optimize recursive solutions. | CLO06 | Lecture | Test questions | <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| **23-24** | Learn to define and call functions in C. Understand function parameters, return values, and scope. Practice using functions for modularizing code and organizing programs logically. Solve problems that require multiple function calls. | CLO04 | Lecture | Test questions | <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| **25-26** | Explore recursion in C. Understand the concept of recursion and how to write recursive functions. Practice solving problems using recursion, and explore how recursion works with function calls and base cases. | CLO04 | Demonstration method using a simulation tool | Test questions, Brain storming sessions | <https://www.coursera.org/learn/c-for-everyone>  <https://www.javatpoint.com/recursion-in-c> | <https://nptel.ac.in/courses/106106210> |
| **27-28** | Understand and implement storage classes (auto, extern, static, register). Focus on how storage classes affect variable scope, lifetime, and visibility. Practice writing programs that demonstrate the use of different storage classes. | CLO04 | Lecture | Test questions | <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| **29-30** | Understand the basics of pointers in C. Practice using pointers to reference variables, manipulate memory, and perform address-based operations. Focus on pointer initialization, dereferencing, and pointer arithmetic. | CLO05 | Lecture | Test questions, Quiz | <https://www.coursera.org/learn/c-for-everyone> | <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| **31-32** | Learn to use pointers with arrays to access and manipulate array elements. Explore pointer arithmetic for array indexing and solving problems involving arrays and memory. | CLO05 | Discussion | Test questions | <https://www.coursera.org/learn/c-for-everyone>  <https://www.oreilly.com/library/view/understanding-and-using/9781449344535/ch04.html> | <https://archive.nptel.ac.in/courses/106/104/106104128/> |
| **33-34** | Implement functions that accept and return pointers. Focus on passing arrays to functions via pointers, modifying data using pointers, and understanding pointer-to-pointer operations. | CLO04 | Demonstration method using a simulation tool | Quiz, Group discussion | <https://www.coursera.org/learn/c-for-everyone> | <https://nptel.ac.in/courses/106106210> |
| **35-38** | Work with 2D arrays in C. Learn how to declare, initialize, and access 2D arrays. Practice manipulating 2D arrays using loops and implement problems that require working with matrices. | CLO05 | Demonstration method using a simulation tool | Quiz, Group discussion | <https://www.coursera.org/learn/c-for-everyone>  <https://www.oreilly.com/library/view/understanding-and-using/9781449344535/ch04.html> | <https://nptel.ac.in/courses/106106210> |
| **39-40** | Learn to write example programs using strings in C, both with and without built-in string functions. Practice declaring and initializing string variables, reading strings, and performing operations like concatenation and comparison. Explore string-handling functions for efficiency and implement custom logic for tasks like reversing strings or counting characters. | CLO06 | Discussion | Test questions | https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/resources/mit6\_087iap10\_lec07/ | <https://archive.nptel.ac.in/courses/106/105/106105171/> |
| **41-45** | Learn the fundamentals of structures in C, starting with their introduction and how to define a structure. Focus on declaring structure variables, accessing structure members, and initializing structures. Practice creating arrays of structures and explore advanced concepts like arrays within structures. Implement real-world examples to understand their applications in data organization. | CLO06 | Discussion | Test questions | https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/resources/mit6\_087iap10\_lec06/ | <https://archive.nptel.ac.in/courses/106/105/106105171/> |

## Remedial Classes9

After every Sessional Test, different types of learners will be identified and special discussions will be planned and scheduled accordingly.

**Action Plan for different types of learners:**

|  |  |  |
| --- | --- | --- |
| **Learner Type-I** | **Learner Type- II** | **Learner Type- III** |
| Remedial Classes, Doubt Sessions, Guided Tutorials | Workshop, Doubt Session | Coding Competitions, Project |

## Self-Learning10

Assignments to promote self-learning, survey of contents from multiple sources.

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| --- | --- | --- | --- | --- |
| **S.No** | **Topics** | **CLO** | **ALM8** | **References/MOOCS** |
| 1. | Data types in C, Basic input/ output functions. | CLO01, CLO02 | Think – Pair- Share,  Peer Review | <https://archive.nptel.ac.in/courses/106/106/106106210/>  <https://www.coursera.org/learn/c-for-everyone>  <https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/calendar/> |
| 2. | Conditional  Statements, Iterations and Functions | CLO03, CLO04 | Think – Pair- Share, Brain  Storming sessions | <https://archive.nptel.ac.in/courses/106/106/106106210/>  <https://www.coursera.org/learn/c-for-everyone> |

## Delivery Details of Content Beyond Syllabus7

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.No** | **Advanced Topics, Additional Reading, Research papers and any** | **CLO** | **POs** | **ALM8** | **References/MOOCS** |
| 1 | Learn file handling in C. Focus on opening, reading from, writing to, and closing files. | CLO06 | PO1, PO3, PO4, PO5, PO11 | Think – Pair- Share,  Peer Review | https://archive.nptel.ac.in/courses/106/104/106104128/ |
|  |  |  |  |  |  |

3 Teaching Learning Methods, Refer to Annexure

4 Active Learning Methods

5 Refer to Annexure 6 Refer to Annexure 7 Refer to Annexure

## Evaluation Scheme & Components:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Type12** | **Evaluation Component9** | **Type of Component10** | **No. of Assessments11** | **% Weightage of Component** | **Max. Marks** | **Mode of Assessment** | **CLO** |
| Formative | Component 1 | Continuous Lab Evaluations | 01\* | 20% | 20 | Viva Voce, Practical, and File | CLO01- CLO06 |
| Summative | Component 2 | Sessional Tests (STs) | 03\*\* | 30% | 30 | Computer Based Test (CBT) | CLO01- CLO06 |
| Summative | Component 3 | End Term Examination | 01\*\*\* | 50% | 50 | CBT | CLO01- CLO06 |
|  | **Total** | | **100%** | | | |  |

*Note: \* Continues Evaluation (CE) is a mandatory evaluation taken once in a semester.*

*\*\* Best two out of three ST will be considered and average marks will be taken for further processing.*

*\*\*\*As per academic guidelines, a minimum of 75% attendance is required to appear in the end-of-semester examination.*

*.*

## Syllabus of the Course:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Subject: Fundamentals of C Programming** | | |  | |
| **S.No.** | **Topic (s)** | **No. of Sessions** | | **Weightage %** |
| 1 | The Problem Solving Aspect, Problem definition phase, Getting started on a problem, The use of specific examples Similarities among problems, General Problem solving strategies. Introduction to programming in C, First Program in C, Variables and Identifiers, Data types, Basic Input Output in C - Characters, Basic Input Output in C - Formatted IO. Arithmetic Operators, Relational and Logical Operators, More Operators, Precedence and Associativity of operators. If statement, if-else statement, if statement mistakes, nested if statements. Conditional Operator, Switch statement, While loop, Looping - For loop, Control with break and continue, Variants of for loop. | **18** | | **40%** |
| **ST-1 (Covering 40% syllabus,**  **Lect. No. 1-18)** | | | | |
| 2 | Nested for loops, Printing patterns with loops, do-while loop, Introduction to recursion: Recursion basic programs like: factorial, Fibonacci, sum of digits, Functions in c, Definition and declaration of a function, Scope of a function. Auto storage class, extern storage class, static storage class, register storage class. Introduction to Pointers in C, Parameter passing techniques, Pointer Arithmetic in C, Pointer Arithmetic with Pointers. Arrays, Searching an Element, Arrays and Memory in C. | **15** | | **33%** |
| **ST-2 (Covering 33% syllabus, Lect. No. 19-33))** | | | | |
| 3 | Pointers with Arrays, Functions and Arrays, 2D Arrays**,** memory allocation using memory management functions, Declaring and Initializing String Variables, Reading and Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions, Example Programs (with and without using built-in string functions), | **07** | | **16%** |
| **ST-3 (Covering 89% syllabus, Lect. No. 1- 40))** | | | | |
| 4 | Introduction, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization, Array of structures, Array within structure. | **05** | | **11%** |
| **End Term (Covering (40%+33 %+16 %+ 11%)=100% syllabus)** | | | | |

1. **Academic Integrity Policy:**

Education at Chitkara University builds on the principle that excellence requires freedom where Honesty and integrity are its prerequisites. Academic honesty in the advancement of knowledge requires that all students and Faculty respect the integrity of one another' s work and recognize the importance of acknowledging and safeguarding intellectual property. Any breach of the same will be tantamount to severe academic penalties.

**This Document is approved by:**

|  |  |  |
| --- | --- | --- |
| **Designation** | **Name** | **Signature** |
| **Course Coordinator** | Dr. Gaganpreet Kaur |  |
| **Program Incharge** | Dr. Preetinder Brar |  |
| **Pro Vice Chancellor** | Dr. Jaiteg Singh |  |
| **Date(DD/MM/YYYY)** | 10.1.25 |  |

# Annexure

## Pre- requisite

Mention The Pre-requisite skill set or course/s if it is expected to be studies before this course, otherwise write “not applicable”.

## NHEQF levels

The NHEQF levels represent a series of sequential stages expressed in terms of a range of learning outcomes against which typical qualifications are positioned/located. NHEQF level 4.5 represents learning outcomes appropriate to the first year (first two semesters) of the undergraduate programme of study, while Level 8 represents learning outcomes appropriate to the doctoral-level programme of study.

Table 1: Higher education qualifications at different levels on the NHEQF

|  |  |
| --- | --- |
| **NHEQF level** | **Examples of higher education qualifications located within each level** |
| Level 4.5 | Undergraduate Certificate. Programme duration: First year (first two semesters) of theundergraduate programme, followed by an exit 4-credit skills-enhancement course(s). |
| Level 5 | Undergraduate Diploma. Programme duration: First two years (first four  semesters) of the undergraduate programme, followed by an exit 4-credit skills-enhancement course(s) lasting two months. |
| Level 5.5 | Bachelor’s Degree. Programme duration: First three years (Six semesters) of the four-yearundergraduate programme. |
| Level 6 | Bachelor’s Degree (Honours/ Honours with Research). Programme duration: Four years(eight semesters). |
| Level 6 | Post-Graduate Diploma. Programme duration: One year (two semesters) for those whoexit after successful completion of the first year (two semesters) of the 2-year master’s programme. |
| Level 6.5 | Master’s degree. (e.g. M.A., M.Com., M.Sc., etc.) Programme duration: Two years (four semesters) after obtaining a 3- year Bachelor’s degree (e.g. B.A., B.Sc., B.Com.etc.). |
| Level 6.5 | Master’s degree. (e.g. M.A., M.Com., M.Sc., etc.) Programme duration: One year (two semesters) after obtaining a 4 - year Bachelor’s degree (Honours/ Honours with Research) (e.g. B.A., B.Sc., B.Com. etc.). |
| Level 7 | Master’s degree.(e.g. M.E./M.Tech. etc.) Programme duration: Two years (four semesters) after obtaining a 4-year Bachelor’s degree. (e.g. B.E./B.Tech. etc.) |
| Level 8 | Doctoral Degree |

## NHEQF level descriptors

Each NHEQF level is structured based on the defined learning outcomes which lead to the expected graduate attributes/profile. The level descriptors reflect the expected outcomes of learning that should be achieved and demonstrated by graduates of a specific programme of study leading to a qualification at a specific NHEQF level.

Click [Learning outcomes descriptors for qualification for all levels on the NHEQF](https://drive.google.com/file/d/1CFZZdRpZm6LHRB__fQ_y9BRCJOWR5Vvs/view?usp=drive_link)

## Sustainable Development Goals (SDG’s)

1. No poverty
2. Zero hunger
3. Good health and well-being
4. Quality Education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry, innovation and infrastructure
10. Reduced inequalities
11. Sustainable cities and economies
12. Responsible consumption and production
13. Climate action
14. Life below water
15. Life on land
16. Peace, justice and strong institutions
17. Partnership for the goals

## Course Outcomes

The number of Course Outcomes is recommended to be 4-5 for courses that do not contain practical component and 6 for those courses with a practical component. Flexibility can be sought by the post-graduate courses in this regard.

## Theory/lab Plan

The following are the guidelines to be followed while creating plans

* Each session may be planned for a duration of 45/50mins (irrespective of the double hour or single hour scheduled in timetable).
* Every session must incorporate at least one active learning method which may or may not be part of the assessments.
* Put BoS Approved Syllabus in the topics. Deviations (if any) from BoS approved syllabus must be brought to the notice of BoS chairman & Dean Academics, After approval, revised handout should be submitted.
* The Topics elaborated in the Theory/Lab plan must match those in the course execution plan.

## Teaching Learning Methods

The following are some of the Teaching & Learning methods that can be incorporated in session wise teaching learning plan.

## Teacher-centered Learning Methods:

1. Lecture
2. Discussion
3. Demonstration method using a simulation or a tool
4. Reviewing
5. Questioning

## Learner-centered teaching & Learning methods:

1. **Active learning**, in which students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class;
2. **Cooperative learning**, in which students work in teams on problems and projects under conditions that assure both positive interdependence and individual accountability; and
3. **Inductive teaching and learning**, in which students are first presented with challenges (questions or problems) and learn the course material in the context of addressing the challenges.
4. **Inductive methods** include inquiry-based learning, case based instruction, problem-based learning, project-based learning, discovery learning, and just-in-time teaching. It is important to integrate authentic, reflective and collaborative learning experiences when designing for student-centered learning.

## Active Learning Methods

The following are some of the Active Learning Methods that can be incorporated in session wise teaching learning plan.

* + - One Minute Paper
    - Group Discussion
    - Student-Created PPT, Charts, Matrices, Flowcharts, Models
    - The Fish Bowl
    - Debate
    - Video Synthesis
    - Quiz/Test Questions
    - Brain Storming Sessions
    - Case Study
    - Shadowing
    - Leading Question
    - Puzzle, Enigma, Contradiction
    - Statement-Opinion-Summary
    - Think / Pair / Share
    - Peer Review
    - Just in Time Teaching
    - Statement-Opinion-Summary
    - Peer Survey
    - Focused Listing
    - Role-Playing
    - Student Field Work with Reflection
    - Infusing Humor into Class Sessions
    - Inviting Effective Guest Speakers

## Remedial Classes

After every Sessional Test, identify weak learners, provide supplement course handout. Student list and Impact Observed report should be submitted to Dean through proper channel.

## Self Learning

Plan 10% of topics in self-learning mode with discussions, ALM’s and Assessment happing in the class.

## Content Beyond Syllabus

Plan Advanced Topics, Experiments, Additional Reading, Research papers in self-learning mode with ALM’s and Assessment happing in the regular class or lab. Usually caters advanced learners. Identify Advanced learners. For Extra classes, schedule should be notified accordingly.

## Assessment Type

1. Assessment broadly can be classified into the following types:
   1. **Diagnostic assessments**: Diagnostic assessments are intended to help teachers identify what students know and can do in different domains to support their students' learning. These help teachers determine strengths of students in various areas to

better address their specific needs.

* 1. **Formative assessments**: Formative assessment refers to a wide variety of methods that teachers use to conduct in-process evaluations of student comprehension, learning needs, and academic progress during a lesson, unit, or a course. Formative assessments help teachers identify concepts that students are struggling to understand, skills they are having difficulty acquiring, or learning standards they have not yet achieved so that adjustments can be made to lessons, instructional techniques, and academic support.
  2. **Summative assessments**: Summative assessment is an assessment administered at the end of an instructional unit in a course. These assessments are intended to evaluate student learning by comparing performance to a standard or benchmark.
  3. **Ipsative assessments**: Ipsative assessment involves comparisons between past and current work to identify a learner's growth over time, rather than progress toward an external set of criteria. Therefore, Ipsative assessment is an internal or self-referenced assessment.
  4. **Norm-referenced assessments**: Norm-referenced tests report whether test takers performed better or worse than a hypothetical average student, which is determined by comparing scores against the performance results of a statistically selected group of test takers, typically of the same age or grade level, who have already taken the exam.
  5. **Criterion-referenced assessments**: Criterion-Reference tests measure the performance of test takers against the criteria covered in the curriculum.
  6. **Peer-to-Peer randomised Assessments**: Peers will be able to provide assessment in this case
  7. **Industry Validation of Effectiveness**: In the Vocation Education, Industry validation of effectiveness of training is particularly important.
  8. **Self-assessments**: To evaluate how much the learner has grasped by self-learning.

1. Other Assessment Methods: Conducting an assessment takes time, thought, attention, planning, and often collaboration. Each assessment tool, whether a short survey or detailed rubric, will be useful only insofar as it both addresses the outcomes well and is feasible to use.
   1. **Rubrics**: For assessing qualitative student work such as essays, projects, reports, or presentations. Rubrics serve well to clearly denote the specific expectations for an assignment, for collecting data for assessment of student learning outcomes. and for student performance. Rubrics can be used for grading, for providing feedback to students, and for informing and encouraging students to think about their own learning.
   2. **Portfolios and E-Portfolio**: Portfolios can provide a window into the process of student learning across a semester-long project that can be assessed (usually by using a rubric).
   3. **Curriculum Mapping**: A good curriculum map can serve to focus assessment, and the improvements that follow, where it will be most useful, informative, or effective.
   4. **Structured Interviews**: While time-consuming, structured interviews are useful when specific questions need to be asked. It also leaves room for unplanned topics or ideas to emerge.
   5. Student Experience Surveys: Student experience in research universities (SERU), including administration of on-line census SERU Undergraduate and Graduate Surveys, can yield important information about student perceptions and experiences.

## Evaluation Component & Types

As per LMs we need to figure it out whether it is component 1, 2 or 3. In Types of Evaluation Component, we need to specify what type of

evaluation we are performing like Continuous Evaluation or Sessional Test or End Term Examination.

## No. of Assessments and Weightage of Components

Department will give guideline for number of assessments, mandatory or optional and weightage.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Learning outcomes descriptors for qualiﬁcation at level 4.5 to 8 on the NHEQF** | | | | | | | | |
|  |  |  |  |  |  |  |  |  |
|  | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 |  |  |
|  | The graduates should be able to demonstrate the acquisition of | | | | | |  |  |
| **NHEQF**  **Level** | **Knowledge and understanding (Refer Keywords of Bloom's Taxonomy Level Knowledge & Understand)** | **General, technical, and professional skills required to perform and accomplish tasks (Refer Keywords of Bloom's Taxonomy Level Analyze)** | **Application of knowledge and skills (Refer Keywords of Bloom's Taxonomy Level Apply)** | **Generic learning outcomes (Use Keywords like Present/Express/ Interpret etc.)** | **Constitutional, humanistic, ethical, and moral values (Refer Keywords like Understand/Practice/F ollow etc)** | **Employability and job- ready skills, and entrepreneurship skills and capabilities/qualities and mindset (Refer Keywords of Bloom's Taxonomy Level Evaluate & Create)** | **Credit requirements** | **Entry requirements** |
| **4.5** | * knowledge of facts, concepts, principles, theories, and processes in broad   multidisciplinary learning contexts within the chosen ﬁelds oﬂearning in broad multidisciplinary learning,   * understanding of the linkages between the learning areas within and across the   chosen ﬁelds of study,   * procedural knowledge required for performing skilled or paraprofessional   tasks associated with the chosen ﬁelds of learning. | * a range of cognitive and technical skills required for accomplishing assigned   tasks relating to the chosen ﬁelds of learning in the context of broad multidisciplinary contexts.   * cognitive skills required to identify, analyze and synthesize information from a range of sources. * cognitive and technical skills required for selecting and using relevant   methods, tools, and materials to assess the appropriateness of approaches to  solving problems associated with the  chosen ﬁelds of learning. | * apply the acquired operational or technical and theoretical knowledge, and a   range of cognitive and practical skills to select and use basic methods, tools, materials, and information to generate solutions to speciﬁc problems relating to  the chosen ﬁelds of learning. | * listen carefully, read texts related to the chosen ﬁelds of study analytically, and present information in a clear and concise manner to different groups/audiences. * express thoughts and ideas effectively in writing and orally and present the results/ﬁndings of the experiments carried out in a clear and concise manner to different groups. * meet one’s own learning needs relating to the chosen ﬁelds of learning. * pursue self-directed and self-managed learning to upgrade the knowledge and skills required for a higher level of education and training. * gather and interpret relevant quantitative and qualitative data to identify problems, * critically evaluate principles and theories associated with the chosen ﬁelds of learning. * make judgment and take decisions, based on analysis of data and evidence, for formulating responses to issues/problems associated with the chosen ﬁelds of learning, requiring the exercise of some personal responsibility for action and outputs/outcomes. | * practice constitutional, humanistic, ethical, and moral values in one’s life, and practice these values in real-life situations, * put forward convincing arguments to respond to the ethical and moral issues associated with the chosen ﬁelds of learning. | * knowledge and a basket of essential skills, required to perform effectively in a deﬁned job relating to the chosen ﬁelds of study, * ability to exercise responsibility for the completion of assigned tasks and for the outputs of own work, and to take some responsibility for group work and output as a member of the group. | * The successful completion of the ﬁrst year (two semesters) of the undergraduate programme of minimum 40 credit hours followed by an exit 4-credit skills-enhance ment course, | * Certiﬁcate obtained after successful completion of Grade 12 or equivalent state   of education.   * Admission to the ﬁrst year of the undergraduate programme will be open to those who have met the entrance requirements, including speciﬁed levels of attainment,   in the programme admission regulations. Admission will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and validation of prior learning outcomes) of the applicant’s ability to pursue an undergraduate programme of study. |
| **5** | * theoretical and technical **knowledge** in broad multidisciplinary contexts within the chosen ﬁelds of learning, * deeper knowledge and **understanding** of one of the learning areas and its underlying principles and theories, * procedural knowledge required for performing skilled or paraprofessional tasks associated with the chosen ﬁelds of learning. | * cognitive and technical **skills** required for **performing** and **accomplishing** complex tasks relating to the chosen ﬁelds of learning, * cognitive and technical skills required to **analyze** and **synthesize** ideas and information from a range of sources and act on information to generate solutions to speciﬁc problems associated with the chosen ﬁelds of learning. | * **apply** the acquired specialized or theoretical knowledge, and a range of cognitive and practical skills to gather quantitative and qualitative data, * **select** and **apply** basic methods, tools, materials, and information to formulate solutions to problems related to the chosen ﬁeld(s) of learning. | * listen carefully, read texts related to the chosen ﬁelds of learning analytically, and **present** complex information in a clear and concise manner to different groups/audiences, * **communicate** in writing and orally the information, arguments, and results of the experiments and studies conducted accurately and effectively to specialist and non-specialist audiences. * meet one’s own learning needs relating to the chosen ﬁeld(s) of learning, work/vocation, and an area of professional practice, * pursue self-paced and self-directed learning to upgrade knowledge and skills required for pursuing a higher level of education and training. * critically **evaluate** the essential theories, policies, and practices by following a scientiﬁc approach to knowledge development. * **make judgement** and **take decision**, based on the analysis and evaluation of information, for determining solutions to a variety of unpredictable problems associated with the chosen ﬁelds of learning, taking responsibility for the nature and quality of outputs. | * **embrace** the constitutional, humanistic, ethical, and moral values, practice these values in life, and take a position regarding these values, * **formulate** arguments in support of actions to address issues relating the ethical and moral issues relating to the chosen ﬁelds of learning, including environmental and sustainable development issues, from multiple perspectives. | * take up job/employment relating to the chosen ﬁelds of study or professional practice requiring the exercise of full personal responsibility for the completion of tasks and for the outputs of own work, and full responsibility for the group task/ work as a member of the group/team. * **exercise**   self-management within the guidelines of study and work contexts.   * **supervise** the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities. | The successful completion of the ﬁrst two years (four semesters) of the undergraduate programme involving a minimum of 80 credit hours followed by an exit 4-credit skills-enhance ment course. | Continuation of study or lateral entry in the second/third year of the undergraduate programme will be possible for those who have met the speciﬁed levels of attainment, speciﬁed in the programme regulations. The continuation of the study will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and certiﬁcation of prior learning) of the applicant’s ability to pursue an undergraduate programme of study. Lateral entry into the programme of study at NHEQF level 5/5.5 will be based on the validation of prior learning outcomes achieved, including those achieved outside of formal learning or through learning and training in the workplace or in the community, through continuing professional development activities, or through independent/self-directed learning activities. |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Learning outcomes descriptors for qualiﬁcation at level 4.5 to 8 on the NHEQF** | | | | | | | | |
|  |  |  |  |  |  |  |  |  |
|  | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 |  |  |
|  | The graduates should be able to demonstrate the acquisition of | | | | | |  |  |
| **NHEQF**  **Level** | **Knowledge and understanding (Refer Keywords of Bloom's Taxonomy Level Knowledge & Understand)** | **General, technical, and professional skills required to perform and accomplish tasks (Refer Keywords of Bloom's Taxonomy Level Analyze)** | **Application of knowledge and skills (Refer Keywords of Bloom's Taxonomy Level Apply)** | **Generic learning outcomes (Use Keywords like Present/Express/ Interpret etc.)** | **Constitutional, humanistic, ethical, and moral values (Refer Keywords like Understand/Practice/F ollow etc)** | **Employability and job- ready skills, and entrepreneurship skills and capabilities/qualities and mindset (Refer Keywords of Bloom's Taxonomy Level Evaluate & Create)** | **Credit requirements** | **Entry requirements** |
| **5.5** | * comprehensive, factual, theoretical, and specialized **knowledge** in broad multidisciplinary contexts with depth in the underlying principles and theories relating to one or more ﬁelds of learning. * knowledge of the current and emerging issues and developments within the chosen ﬁeld(s) of learning. * procedural knowledge required for performing and accomplishing professional tasks associated with the chosen ﬁelds of learning. | * cognitive and technical skills required for **performing** and **accomplishing** complex tasks relating to the chosen ﬁelds of learning. * cognitive and technical skills required to **evaluate** and **analyze** complex ideas, * cognitive and technical skills required to **generate solutions** to speciﬁc problems associated with the chosen ﬁelds of learning. | * **apply** the acquired specialized technical or theoretical knowledge, and cognitive and practical skills to gather and analyze quantitative/ qualitative data to assess the appropriateness of different approaches to solving problems, * **employ** the right approach to generate solutions to problems related to the chosen ﬁelds of learning. | * listen carefully, to read text related to the chosen ﬁelds of learning analytically and **present** complex information in a clear and concise manner to different groups/audiences. * **communicate** in writing and orally the constructs and methodologies adopted for the studies undertaken relating to the chosen ﬁelds of learning, * make coherent arguments to support the ﬁndings/results of the study undertaken to specialist and non-specialist audiences. * meet one’s own learning needs relating to the chosen ﬁeld(s) of learning, * **pursue** self-paced and self-directed learning to upgrade knowledge and skills that will help adapt to changing demands of the workplace and pursue higher level of education and training. * critically **evaluate** evidence for taking actions to generate solutions to speciﬁc problems associated with the chosen ﬁelds of learning based on empirical evidence. * **make judgement** and **take decisions** based on the analysis and evaluation of information for formulating responses to problems, including real-life problems, * **exercise judgement** across a broad range of functions based on empirical evidence, for determining personal and/or group actions to generate solutions to speciﬁc problems associated with the chosen ﬁelds of learning. | * **Embrace** constitutional, humanistic, ethical, and moral values, and practice these values in life. * **identify** ethical issues related to the chosen ﬁelds of study, * **formulate** coherent arguments about ethical and moral issues, including environmental and sustainable development issues, from multiple perspectives. * **follow** ethical practices in all aspects of research and development, including avoiding unethical practices such as fabrication, falsiﬁcation or misrepresentation of data or committing plagiarism. | * knowledge and essential skills set and competence that are necessary to take up a professional job relating to the chosen ﬁeld of learning and professional practice, * entrepreneurship skills and mindset required for setting up and running an economic enterprise or pursuing   self-employment requiring the exercise of full personal responsibility for the outputs of own work, and full responsibility for the output of the group,   * the ability to **exercise management and supervision** in the contexts of work or study activities involving unpredictable work processes and working   environments. | The successful completion of the ﬁrst three years (six semesters) of the undergraduate programme involving a minimum of 120 credit hours |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Learning outcomes descriptors for qualiﬁcation at level 4.5 to 8 on the NHEQF** | | | | | | | | |
|  |  |  |  |  |  |  |  |  |
|  | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 |  |  |
|  | The graduates should be able to demonstrate the acquisition of | | | | | |  |  |
| **NHEQF**  **Level** | **Knowledge and understanding (Refer Keywords of Bloom's Taxonomy Level Knowledge & Understand)** | **General, technical, and professional skills required to perform and accomplish tasks (Refer Keywords of Bloom's Taxonomy Level Analyze)** | **Application of knowledge and skills (Refer Keywords of Bloom's Taxonomy Level Apply)** | **Generic learning outcomes (Use Keywords like Present/Express/ Interpret etc.)** | **Constitutional, humanistic, ethical, and moral values (Refer Keywords like Understand/Practice/F ollow etc)** | **Employability and job- ready skills, and entrepreneurship skills and capabilities/qualities and mindset (Refer Keywords of Bloom's Taxonomy Level Evaluate & Create)** | **Credit requirements** | **Entry requirements** |
| **6** | * **advanced knowledge** about a specialized ﬁeld of enquiry, with depth in one or more ﬁelds of learning within a broad multidisciplinary/ interdisciplinary context. * a **coherent understanding** of the established methods and techniques of research and enquiry applicable to the chosen ﬁelds of learning. * an awareness and knowledge of the emerging developments and issues in the chosen ﬁelds of learning, * procedural knowledge required for performing and accomplishing professional tasks associated with the chosen ﬁelds of learning. | * a range of cognitive and technical skills required for **performing and accomplishing** complex tasks relating to the chosen ﬁelds of learning, * cognitive and technical skills relating to the established research methods and techniques, * cognitive and technical skills required to **evaluate** complex ideas and undertake research and investigations to generate solutions to real-life problems, * **generate solutions** to complex problems independently, requiring the exercise of full personal judgement, responsibility, and accountability for the output of the initiatives taken as a practitioner. | * **apply** the acquired advanced technical and/or theoretical knowledge and a range of cognitive and practical skills to analyze the quantitative and qualitative data gathered drawing on a wide range of sources for identifying problems and issues relating to the chosen ﬁelds of learning, * apply advanced knowledge relating to research methods to carry out research and investigations to formulate evidence-based solutions to complex and unpredictable problems. | * listen carefully, read texts and research papers analytically, and **present** complex information in a clear and concise manner to different groups/ audiences, * **communicate** technical information and explanations, and the ﬁndings/ results of the research studies relating to specialized ﬁelds of learning, * present in a concise manner one’s views on the relevance and applications of the ﬁndings of research and evaluation studies in the context of emerging developments and issues. * meet own learning needs relating to the chosen ﬁelds of learning, * pursue self-paced and self-directed learning to upgrade knowledge and skills that will help accomplish complex tasks and pursue a higher level of education and research. * a keen **sense of observation**, enquiry, and capability for asking relevant/ appropriate questions, * the ability to **problematize, synthesize and articulate**   issues and design research proposals,   * the ability to **deﬁne** problems, formulate appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict   cause-and-effect relationships,   * the capacity to **develop** appropriate tools for data collection, * the ability to **plan, execute and report** the results of an experiment or investigation, * the ability to **acquire** the understanding of basic research ethics and skills in practicing/doing ethics in the ﬁeld/ in own research work, regardless of the funding authority or ﬁeld of study, * **examine and assess** the implications and consequences of emerging developments and issues relating to the chosen ﬁelds of study based on empirical evidence. * **make judgement** in a range of situations by critically reviewing and consolidating evidence, * **exercise judgement** based on evaluation of evidence from a range of sources to generate solutions to complex problems, including real-life problems, associated with the chosen ﬁeld(s) of learning requiring the exercise of full personal responsibility and accountability for the initiatives undertaken and the outputs/outcomes of own work as well as of the group as a team member. | * **Embrace** and practice constitutional, humanistic, ethical, and moral values in life. * **adopt** objective, unbiased, and truthful actions in all aspects of work related to the chosen ﬁeld(s) of learning and professional practice. * **present** coherent arguments in support of relevant ethical and moral issues. * **participate** in actions to address environmental and sustainable development issues. * **follow** ethical practices in all aspects of research and development, including avoiding unethical practices such as fabrication, falsiﬁcation, or misrepresentation of data or committing plagiarism. | * **adapting** to the future of work and to the demands of the fast pace of technological developments and innovations that drive a shift in employers’ demands for skills, particularly with respect to the transition towards more   technology-assisted work involving the creation of new forms of work and rapidly changing work and production processes.   * **managing** complex technical or professional activities or projects, requiring the exercise of full personal responsibility for the output of own work as well as for the outputs of the group as a member of the group/team. * **exercising** supervision in the context of work having unpredictable changes. | Successful completion of the 4-year (eight semesters) undergraduate programme involving a minimum of 160 credits, with a minimum of 40 credits each at level 4.5, 5, 5.5, and 6 of the NHEQF.  A  1-year/2-seme ster  Post-Graduate Diploma programme builds on a  3-year/6-seme ster bachelor’s degree and requires a minimum of 40 credits for individuals who have completed a Bachelor’s programme. | * An individual seeking admission to the bachelor’s degree (Honours/ Honours with Research) in a speciﬁed ﬁeld of learning would normally have completed all requirements of the relevant   3-year Bachelor’s degree. (After completing the requirements of a 3-year bachelor’s degree, candidates who meet a minimum 75% marks or its equivalent grade will be allowed to continue studies in the fourth year of the undergraduate programme leading to the bachelor’s degree (Honours with Research).   * Continuation of undergraduate programme leading to the bachelor’s degree (Honours/ Honours with Research) will be open to those who have met the speciﬁed levels of attainment, in the programme admission regulations. Continuation of the programme of study will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and certiﬁcation of prior learning) of the applicant’s ability to pursue study during the fourth year (semesters 7 & 8) of the 4-year Bachelor’s degree (Honours/ Honours with Research) programme. Lateral entry into the programme of study at NHEQF level 6 will be based on the validation of prior learning outcomes, including those achieved outside of formal learning or through learning and training in the workplace, through continuing professional development activities, or through independent/self-directed/self-m   anaged learning activities. |

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| **Learning outcomes descriptors for qualiﬁcation at level 4.5 to 8 on the NHEQF** | | | | | | | | |
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|  | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 |  |  |
|  | The graduates should be able to demonstrate the acquisition of | | | | | |  |  |
| **NHEQF**  **Level** | **Knowledge and understanding (Refer Keywords of Bloom's Taxonomy Level Knowledge & Understand)** | **General, technical, and professional skills required to perform and accomplish tasks (Refer Keywords of Bloom's Taxonomy Level Analyze)** | **Application of knowledge and skills (Refer Keywords of Bloom's Taxonomy Level Apply)** | **Generic learning outcomes (Use Keywords like Present/Express/ Interpret etc.)** | **Constitutional, humanistic, ethical, and moral values (Refer Keywords like Understand/Practice/F ollow etc)** | **Employability and job- ready skills, and entrepreneurship skills and capabilities/qualities and mindset (Refer Keywords of Bloom's Taxonomy Level Evaluate & Create)** | **Credit requirements** | **Entry requirements** |
| **6.5** | * **advanced knowledge** about a specialized ﬁeld of enquiry with a critical understanding of the emerging developments and issues relating to one or more ﬁelds of learning, * advanced knowledge and understanding of the research principles, methods, and techniques applicable to the chosen ﬁeld(s) of learning or professional practice, * procedural knowledge required for **performing and accomplishing** complex and specialized and professional tasks relating to teaching, and research and development. | * advanced cognitive and technical skills required for **performing and accomplishing** complex tasks related to the chosen ﬁelds of learning. * advanced cognitive and technical skills required for **evaluating** research ﬁndings and designing and conducting relevant research that contributes to the generation of new knowledge. * specialized cognitive and technical skills relating to a body of knowledge and practice to **analyze and synthesize** complex information and problems. | * **apply** the acquired advanced theoretical and/or technical knowledge about a specialized ﬁeld of enquiry or professional practice and a range of cognitive and practical skills to identify and analyze problems and issues, including real-life problems, associated with the chosen ﬁelds of learning. * apply advanced knowledge relating to research methods to carry out research and investigations to formulate evidence-based solutions to complex and unpredictable problems. | * listen carefully, read texts and research papers analytically and **present** complex information in a clear and concise manner to different groups/audiences, * **communicate**, in a well-structured manner, technical information and explanations, and the ﬁndings/results of the research studies undertaken in the chosen ﬁeld of study, * present in a concise manner view on the relevance and applications of the ﬁndings of recent research and evaluation studies in the context of emerging developments and issues. * **evaluate** the reliability and relevance of evidence; identify logical ﬂaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. * meet one’s own learning needs relating to the chosen ﬁelds of learning, work/vocation, and an area of professional practice, * **pursue** self-paced and self-directed learning to upgrade knowledge and skills, including research-related skills, required to pursue a higher level of education and research. * **problematize, synthesize, and articulate** issues and design research proposals, * **deﬁne** problems, **formulate** appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict   cause-and-effect relationships,   * **develop** appropriate tools for data collection for research, * the ability to use appropriate statistical and other analytical tools and techniques for the analysis of data collected for research and evaluation studies, * **plan, execute, and report** the results of an investigation, * follow basic research ethics and skills in practicing/doing ethics in the ﬁeld/ in one’s own research work. * **make judgements and take decisions** regarding the adoption of approaches to solving problems, including real-life problems, based on the analysis and evaluation of information and empirical evidence collected. * make judgement across a range of functions requiring the exercise of full responsibility and accountability for personal and/or group actions to generate solutions to speciﬁc problems associated with the chosen   ﬁelds/subﬁelds of study, work, or professional practice. | * **embrace** and practice constitutional, humanistic, ethical, and moral values in one’s life, * **adopt** objective and unbiased actions in all aspects of work related to the chosen ﬁelds/subﬁelds of study and professional practice, * **participate** in actions to address environmental protection and sustainable development issues, * support relevant ethical and moral issues by **formulating and presenting** coherent arguments, * **follow** ethical principles and practices in all aspects of research and development, including inducements for enrolling participants, avoiding unethical practices such as fabrication, falsiﬁcation or misrepresentation of data or committing plagiarism. | * **adapting** to the future of work and responding to the demands of the fast pace of technological developments and innovations that drive the shift in employers’ demands for skills, particularly with respect to the transition towards more   technology-assisted work involving the creation of new forms of work and rapidly changing work and production processes.   * **exercising** full personal responsibility for the output of own work as well as for group/team outputs and for managing work that is complex and unpredictable requiring new strategic approaches. | * A   1-year/2-seme ster master’s programme builds on a bachelor’s degree with Honours/ Honours with Research and requires a minimum of 40 credits for individuals who have completed a Bachelor’s degree (Honours/ Honours with Research).   * The  1. year/4-seme ster Master’s programme builds on a 2. year/6-seme ster bachelor’s degree and requires a total of a minimum of 80 credits from the ﬁrst and second years of the programme, with a minimum of 40 credits in the ﬁrst year and minimum of 40 credits in the second year of the programme at level 6.5 on the NHEQF. | * A 3-year Bachelor’s degree for the 2-year/4-semester Master’s degree programme (e.g. M.A., M.Com., M.Sc., etc.). * A 4-year Bachelor’s Degree for the 1-year/2-semester Master’s programme (e.g. M.A., M.Com., M.Sc., etc.). * Admission to a programme of study leading to the Master’s degree is open to those who have met the speciﬁed levels of attainment, speciﬁed in the programme admission regulations. Admission will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and certiﬁcation of prior learning) indicating the applicant’s ability to pursue postgraduate study. |

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| **Learning outcomes descriptors for qualiﬁcation at level 4.5 to 8 on the NHEQF** | | | | | | | | |
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|  | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 |  |  |
|  | The graduates should be able to demonstrate the acquisition of | | | | | |  |  |
| **NHEQF**  **Level** | **Knowledge and understanding (Refer Keywords of Bloom's Taxonomy Level Knowledge & Understand)** | **General, technical, and professional skills required to perform and accomplish tasks (Refer Keywords of Bloom's Taxonomy Level Analyze)** | **Application of knowledge and skills (Refer Keywords of Bloom's Taxonomy Level Apply)** | **Generic learning outcomes (Use Keywords like Present/Express/ Interpret etc.)** | **Constitutional, humanistic, ethical, and moral values (Refer Keywords like Understand/Practice/F ollow etc)** | **Employability and job- ready skills, and entrepreneurship skills and capabilities/qualities and mindset (Refer Keywords of Bloom's Taxonomy Level Evaluate & Create)** | **Credit requirements** | **Entry requirements** |
| **7** | * **advanced knowledge** about a specialized ﬁeld of enquiry with a critical understanding of the emerging developments and issues relating to one or more ﬁelds of learning, * advanced knowledge and **understanding** of the research principles, methods, and techniques applicable to the chosen ﬁeld(s) of learning or professional practice, * procedural knowledge required for **performing and accomplishing** complex and specialized and professional tasks relating to teaching, and research and development. | * advanced cognitive and technical skills required for **performing and accomplishing** complex tasks related to the chosen ﬁelds of learning. * advanced cognitive and technical skills required for evaluating research ﬁndings and designing and **conducting** relevant research that contributes to the generation of new knowledge. * specialized cognitive and technical skills relating to a body of knowledge and **practice to analyze and synthesize** complex information and problems. | * **apply** the acquired advanced theoretical and/or technical knowledge about a specialized ﬁeld of enquiry or professional practice and a range of cognitive and practical skills to identify and analyze problems and issues, including real-life problems, associated with the chosen ﬁelds of learning. * apply advanced knowledge relating to research methods to carry out research and investigations to formulate evidence-based solutions to complex and unpredictable problems. | * listen carefully, read texts and research papers analytically, and **present** complex information in a clear and concise manner to different groups/audiences, * **communicate**, in a well-structured manner, technical information and explanations, and the ﬁndings/results of the research studies undertaken in the chosen ﬁeld of study, * present in a concise manner view on the relevance and applications of the ﬁndings of recent research and evaluation studies in the context of emerging developments and issues. * **evaluate** the reliability and relevance of evidence; identify logical ﬂaws and holes in the arguments of others; **analyze and synthesize** data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. * meet one’s own learning needs relating to the chosen ﬁelds of learning, work/vocation, and an area of professional practice, * pursue self-paced and self-directed learning to upgrade knowledge and skills, including research-related skills, required to pursue higher level of education and research. * **problematize, synthesize, and articulate** issues and design research proposals, * **deﬁne** problems, **formulate** appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict   cause-and-effect relationships,   * **develop** appropriate tools for data collection for research, * the ability to use appropriate statistical and other analytical tools and techniques for the analysis of data collected for research and evaluation studies, * **plan, execute, and report** the results of an investigation, * **follow** basic research ethics and skills in practicing/doing ethics in the ﬁeld/ in one’s own research work. * **make judgements and take decisions** regarding the adoption of approaches to solving problems, including real-life problems, based on the analysis and evaluation of information and empirical evidence collected. * make judgement across a range of functions requiring the exercise of full responsibility and accountability for personal and/or group actions to generate solutions to speciﬁc problems associated with the chosen   ﬁelds/subﬁelds of study, work, or professional practice. | * **embrace** and practice constitutional, humanistic, ethical, and moral values in one’s life, * **adopt** objective and unbiased actions in all aspects of work related to the chosen ﬁelds/subﬁelds of study and professional practice, * **participate** in actions to address environmental protection and sustainable development issues, * **support** relevant ethical and moral issues by formulating and presenting coherent arguments, * **follow** ethical principles and practices in all aspects of research and development, including inducements for enrolling participants, avoiding unethical practices such as fabrication, falsiﬁcation or misrepresentation of data or committing plagiarism. | * **adapting** to the future of work and responding to the demands of the fast pace of technological developments and innovations that drive shift in employers’ demands for skills, particularly with respect to the transition towards more   technology-assisted work involving the creation of new forms of work and rapidly changing work and production processes.   * **exercising** full personal responsibility for the output of own work as well as for group/team outputs and for managing work that are complex and unpredictable requiring new strategic approaches. | * The   2-year/4-seme ster Master’s programme (e.g., M.E.,  M.Tech. etc.) builds on a  4-year/8-seme ster bachelor’s degree (e.g.  B.E., B.Tech.  etc.) and requires a total of minimum of 80 credits from the ﬁrst and second years of the programme, with minimum of 40 credits in the ﬁrst year and minimum of 40 credits in the second year of the programme at level 6 on the NHEQF. | * A 4-year Bachelor’s degree (e.g. B.E., B.Tech. etc.) for the   2-year/4-semester Master’s programme (e.g. M.E., M. Tech. etc.).   * Admission to a programme of study leading to the Master’s degree is open to those who have met the speciﬁed levels of attainment, speciﬁed in the programme admission regulations. Admission will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and certiﬁcation of prior learning) indicating the applicant’s ability to pursue postgraduate study. |

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| **Learning outcomes descriptors for qualiﬁcation at level 4.5 to 8 on the NHEQF** | | | | | | | | |
|  |  |  |  |  |  |  |  |  |
|  | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 |  |  |
|  | The graduates should be able to demonstrate the acquisition of | | | | | |  |  |
| **NHEQF**  **Level** | **Knowledge and understanding (Refer Keywords of Bloom's Taxonomy Level Knowledge & Understand)** | **General, technical, and professional skills required to perform and accomplish tasks (Refer Keywords of Bloom's Taxonomy Level Analyze)** | **Application of knowledge and skills (Refer Keywords of Bloom's Taxonomy Level Apply)** | **Generic learning outcomes (Use Keywords like Present/Express/ Interpret etc.)** | **Constitutional, humanistic, ethical, and moral values (Refer Keywords like Understand/Practice/F ollow etc)** | **Employability and job- ready skills, and entrepreneurship skills and capabilities/qualities and mindset (Refer Keywords of Bloom's Taxonomy Level Evaluate & Create)** | **Credit requirements** | **Entry requirements** |
| **8** | * **highly specialized knowledge**, including knowledge at the most advanced frontiers of the chosen ﬁelds of study. * **mastery** of the established research methods and techniques applicable to the chosen ﬁelds of learning. * **procedural knowledge** required by personnel engaged in complex research and development activities. | * **most advanced and highly specialized** cognitive and technical skills required for performing and accomplishing complex tasks related to research and development that make original contributions to knowledge, professional practice, and innovations. * cognitive and technical skills required for **conceptualizing, designing, and implementing** fundamental and/or applied research at the forefront of the chosen ﬁeld(s) of learning to generate original knowledge. * cognitive and technical skills required for **doing transdisciplinary research**. | * **apply** the acquired highly specialized knowledge, skills, and methods of research to design and conduct original and high quality disciplinary or multidisciplinary or interdisciplinary research to generate evidence-based solutions to complex problems, including   real-life problems, relating to the chosen ﬁeld(s) of study. | * listen carefully, read texts and research papers analytically, and present complex information in a clear and concise manner to non-specialist and specialist groups/audiences. * **present**, in a well-structured and logical manner, technical information and explanations pertaining to the results/ﬁndings of research studies undertaken. * present views on the relevance and application of recent research and their applications in the context of the emerging developments and issues related to the chosen ﬁeld(s) of study or professional practice. * meet own learning needs relating to research and investigations in the chosen ﬁelds of study. * **pursue** self-paced and self-directed learning to upgrade knowledge and skills, including research-related skills, required to pursue higher level of research related to new frontiers of knowledge. * **critically analyze and synthesize** a body of knowledge in their major and allied ﬁelds, identify critical gaps and ask new questions, develop new tools and techniques of data gathering and analysis, and at the end of it be able to conduct research independently. * **evaluate** the reliability and relevance of evidence; identify logical ﬂaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints. * **make judgements and take decisions** regarding the formulation of responses to problems, including real-life problems, based on the analysis and evaluation of information and empirical evidence relating to the problems. * **make signiﬁcant judgment** across a broad range of functions requiring the exercise of responsibility for determining personal and/or group actions to generate solutions to speciﬁc problems associated with the chosen   ﬁeld(s) of study, work/vocation, or professional practice. | * **practice** constitutional, humanistic, ethical, and moral values in life, adopt objective and unbiased actions in all aspects of work, * **identify** ethical issues related to the chosen ﬁelds of research, including those relating to environmental and sustainable development issues, * **follow** ethical practices in all aspects of research and development, including avoiding practices such as fabrication, falsiﬁcation or misrepresentation of data or committing plagiarism, and not adhering to intellectual property rights, * **acquire** the understanding of basic research ethics and skills in practicing/doing ethics in the ﬁeld/in own research work, regardless of the funding authority or ﬁeld of study. | * **adapting** to the future of work and responding to the demands of the fast pace of technological developments and innovations that drive shift in skill needs relating to work and professional practices, including those relating to teaching, research, and development, * **exercising** full personal responsibility for outputs/outcomes of own work and outputs/outcomes of group efforts, * exercising substantial authority, innovation, autonomy, professional integrity, and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research. | * The major feature of all doctorate degrees is original research. The body of work that leads to the award of a doctorate degree will include coursework and a thesis with published work and/or creative work (for example, in the case of visual or performing arts). | * A graduate of a   1-year/2-semester Master’s programme, or a 2-year/  4-semester Master’s programme, or a 4-year/8- semester Bachelor’s degree   * Admission to a programme of study leading to the doctoral degree is open to those who have met the entrance requirements, including speciﬁed levels of attainment, in the programme admission regulations. Admission will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and certiﬁcation of prior learning) of the applicant’s ability to pursue study for a doctoral degree relating to a specialized ﬁeld of enquiry. |